AN ASSESSMENT OF COMMUNICATION TECHNOLOGY ADOPTION IN TEXAS COOPERATIVES

A Thesis

by

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ABSTRACT

This study focuses on identifying communication technology adoption behaviors to provide educational benchmarks for Texas cooperatives. A survey was conducted with questions identifying a range of variables describing adoption behavior of communication technology from the background of cooperative managers to board management policy. The survey categorized 105 different cooperatives by current technology use and management practices. Once the data were collected, a factor analysis to understand underlying relationships of variables was conducted.

The survey found that Texas cooperative managers are willing to expand on their current use of communication technology, however a clear definition of how to use new concepts as a powerful tool is needed. In terms of governance, we found that many cooperatives have no stated policies regarding the use of communication technologies. Generally, those cooperatives that had defined technology use policies were more likely to be using more forms of technology. Through a logistic and ordered logistic regression of the data, the study did not reflect our initial hypothesis that age of the respondent and the years working for a cooperative (manger characteristics) would be a significant factor in estimating Texas cooperatives' willingness to adopt new forms of communication technology and social media. However, the cooperatives' technology adoption behavior can best be explained by the data produced from descriptive cooperative information and the existence of employee communication technology

policies. Likewise, cooperatives' willingness to adopt social media can best be explained by the data produced from manager attitudes and cooperatives' concerns.

DEDICATION

This study is dedicated to the Texas agricultural producers who participate in the cooperative business structure, because their efforts feed and clothe the world. This study is also dedicated to Mike and Frances Murch. Their determination and work ethic are a true testament to the spirit of this great nation.

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CHAPTER I

INTRODUCTION

Background

The advancement of communication technology in the modern business atmosphere continually improves customer relations through the rapid exchange of information, ideas and insight. “Business blogs, corporate Facebook pages, instructional YouTube videos, private enterprise-grade social networking platforms, and other social media and web 2.0 tools can facilitate speedy and successful two-way communication with customers, as well as well as creative and constructive collaboration with colleagues” (Flynn 2012). As technology progresses, the importance of understanding the capacity of specific tools to improve business functions becomes paramount. The Millennial Generation, or Generation Y, is composed of individuals born in the 1980’s and 1990’s. By 2010, they will outnumber the Baby Boom generation, which has formed a large portion of the workforce over the last 40 years. This rising generation has not only entered the work force, but is transforming modern business practices. According to author Erik Qualman, ninety six percent of Generation Y has joined a social network (Qualman 2010). The visible evolution of the interfacing between customers and businesses has created a “unique social atmosphere that challenges traditional communication behaviors” (Pritchett 2011). Qualman reports that it took the radio 38 years to reach 50 million users, the television 13 years, and the internet only 4 (Qualman 2010). Compare that to the more than 100 million users that Facebook added in less than nine months, and it becomes quite evident that shifts are occurring in the ways we

communicate. A business can stimulate healthy customer interaction and internal dialogue from the proper employment use of social media strategies, digital communication practices for the Board of Directors, and flexible adoption policies that adapt to the influx of technology.

Statement of the Problem and Research Objectives

United by a trade association called the Texas Agricultural Cooperative Council (TACC), Texas cooperatives have identified the necessity for a survey of management practices regarding the general use of communication and information technology as it pertains to the workplace. Prior to this study, no formal compilation of aggregate benchmarks regarding the use of communication technology has been established for the Texas cooperative industry. In a sense, the industry has been walking through a fog without knowing by what standard to compare its technology adoption behavior against. This study identifies the adoption and use of communication and information technology by Texas cooperatives. The study seeks to establish a better understanding of how cooperatives interact with their customers and achieve their business objectives through the adoption and use of cell phones, computers, social media, and more. Through initial investigation with members of the Texas Agricultural Cooperative Council, the following specific objectives have been identified:

1. Provide industry benchmarks on the use and attitudes of Texas cooperatives toward communication technology, including social media.
2. Develop a profile of those who are likely to adopt communication technology.

3. Identify concerns and challenges that prevent cooperatives from utilizing communication technologies.
4. Identify opportunities for future educational programming among Texas cooperatives.

Outline of the Texas Cooperative Industry

As defined by David Barton, "a cooperative is a user-owned and user-controlled business that distributes benefits on the basis of use" (Barton 1989). Specifically, the cooperative industry plays an integral part in Texas agriculture. As a whole, agricultural cooperatives in Texas contribute a formidable presence in the Texas economy by impacting 1 out of every 3 Texans (Baros et al. 2009). In 2009, the Texas AgriLife Extension Service produced a study of Texas cooperatives that reflected an economic contribution of over $1.7 billion in sales, $826 million in value added to the Texas GDP, $564 million to Texans' income and the support of 20,879 jobs in the Texas economy. In respect to agricultural production, "cooperatives influence[d] 60% of cotton acres, 48% of sorghum acres, 59% of corn acres and 50% of wheat acres for the state of Texas" (Baros et al. 2009). As of 2010, the number of marketing, supply, and service cooperatives totaled 189 (USDA Rural Development 2010). Comprising those 189 cooperatives are 74,700 total members, and produce gross and net sales of $5,164.56 and $4,697.42 million, respectively (USDA Rural Development 2010). The combined role of the cooperative business structure in both agricultural production and overall contribution to the Texas GDP indicates the importance of this audience. We hope this

study can offer practical application of knowledge, and a useful service to cooperative managers and directors through the improvement of customer relations.

Outline of the Study

Chapter II gives a review of the literature regarding technology adoption studies, and appropriate survey design. The methods conducted for the study are explained in Chapter III Methodology. The simulated results gathered from the study are expressed in Chapter IV Results. The summary of results and all findings are discussed in Chapter V Conclusion. This research was conducted during the spring of 2012 with the support of the Texas AgriLife Extension Service and the Roy B. Davis Professorship in Agricultural Cooperation at Texas A&M University.

CHAPTER II

REVIEW OF LITERATURE

An original review of literature pertaining to the study was conducted to satisfy the timeliness of the subject matter, as well build a foundation from previous studies with the inclusion of discrete choice models. The primary goal of the study, to provide educational benchmarks through communication technology, prompts the discussion of survey design, as well as a review of previous studies that analyze the adoption of new forms of communication technology.

Survey Design

The survey design incorporated previous researchers' (Baros et al. 2009) survey methods to obtain sufficient descriptive data previously associated with the Texas cooperative industry, adapted to communication technology adoption behavior. Baros et al. gathered data from 96 locally-owned Texas agricultural cooperatives from the current member list of the TACC. The survey prompted questions calling for both discrete and categorical data to explain the overall economic impact of the TACC members on the Texas economy (Baros et al. 2009). Attempting to build on the success of Baros et al, this study employed a survey targeted at all Texas cooperatives from a list of members and nonmembers maintained by TACC. Similar to Baros et al., the survey incorporated general questions about the structure of the cooperative business, but also included ordered categorical data on the use of communication technology. The ordered categorical data incorporates Likert scales to denote the degree of attitude the respondent

feels towards a specific statement or management practice. The survey is presented in its entirety in Appendix A.

Holcomb and Kenkel's survey of the Oklahoma Food Cooperative's (OFC) customer-members was also used as a model to form our study. Holcomb and Kenkel's study employed a survey focused on "determin[ing] the factors driving customer-members' participation in the OFC and assess the significance of the OFC as a marketing outlet to supplier-members" (Holcomb and Kenkel 2011). Both discrete and ordered categorical data questions were used to produce summary statistics describing members' participation in the cooperative, scaled attitudes toward specific management practices and Internet usage. The study "represent[ed] a response rate of 24.7% for supplier-members and 11.0% for customer-members"; keeping in mind "that a median month's business activity through the cooperative is transacted by an average of 60 supplier-members and 650 customer-members" (Holcomb and Kenkel 2011). Holcomb and Kenkel's methods spurred a collective discovery from a loosely scattered population within a similar target business structure as this study.

Dillman's survey design method was incorporated into the study to avoid unnecessary wording biases. The book suggests analyzing each question by degree of vagueness, understanding, and preciseness to avoid wording biases (Dillman 1978). Dillman argues that question structure determines "the nature of response behavior" from the respondent (Dillman 1978). Each question of the survey should be structured as either an open-ended type, close-ended with ordered choices type, close-ended with unordered response choices type, or partially close-ended type (Dillman 1978). Dillman

discusses common consequences of skewed/biased data stemming from improper survey length, questions with unclear objectives and improper wording warranting elicitation of specific behavior.

Communication Technology Adoption

Determining adoption behaviors regarding technology use is not a new concept. As technology continually progresses to satisfy business and consumer needs, a snap shot of current practices properly assesses industry standards. The review of the following studies in this section identify the process to determine current technology adoption practices, as well as how that process can be applied in a market analysis.

In 2003, Venkatesh et al. sought to bring together all previous research on technology acceptance by creating a theoretical model called the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2003). The UTAUT sought to "provide a tool for managers needing to assess the likelihood of success for new technology introductions and help them understand the drivers of acceptance" (Venkatesh et al. 2003). The model found that performance expectancy, effort expectancy, and social influence determined respondents' intentions of use, whereas intention and facilitating conditions determined usage behavior (2003). Behind those five factors, gender, age, experience, and voluntariness were the main drivers of significance (Venkatesh et al. 2003). This study set a precedent for market research, and is cited in nearly every subsequent technology acceptance model. For this study, we hypothesize that age and experience of cooperative managers will be a significant variable in predicting technology adoption behavior.

In 2008, Eyrich et al. conducted a survey to outline the adoption behaviors of public relation practitioners in regards to social media tools and communication technology. The study "surveyed working public relations practitioners about their adoption of 18 social media tools and their perception on the growth of social media trends in public relations practice" (Eyrich et al. 2008). The survey is similar to ours in questions regarding technology adoption. With a response rate of 33.23%, the study found that "overall, respondents on average used 5.97 of the 18 tools listed", with the majority reporting use of e-mail, intranet, blogs, videoconferencing, podcasts, video sharing, and PDAs (Eyrich et al. 2008). The lesser used tools, but still relevant for our analysis, included instant messaging, social networking, text messaging, photo sharing, and wikis (Eyrich et al. 2008). The study also looked at how widely adopted social media was in the respective industry using a Likert scale response with a range of "never" (1) to "all the time" (5) (Eyrich et al. 2008). The study used an additive sum index of the scaled responses to the 18 tools, and "showed the overall perception that social media was being used in the industry some of the time" (Eyrich et al. 2008). Eyrich et al. provided "one of the first academic studies to provide data on overall social media adoption", and gives insight on how to capture a "quick snapshot of adoption trends in [an] industry" (Eyrich et al. 2008).

In 2009, Thach sought to determine the use of communication technology by wineries "via social networks, blogs, vlogs, podcasts, and online virtual communities" (Thach 2009). The study engaged a random sample of 208 U.S. wineries, and identified their communication behaviors with their customers. Thach found that U.S. wineries, for

the most part, did not employ the use of the defined communication technologies. Out of the sample, "only five wineries included a blog; only three wineries included a podcast; and 23 wineries had vlogs" (Thach 2009). Although the study found that the majority of the wineries were not employing the technology, it highlights the beginning of the use of similar practices currently being adopted today in other agribusinesses. The results found by Thach provide a comparative base for the purposes of this study, and highlights what else can be done.

In 2011, O'Neill et al. conducted a study which implemented an online survey "to determine the social media capacity and activity" for a specific population (O'Neill et al. 2011). The survey found that "seven in 10 respondents said their educational institution did not have a social media policy or they did not know if one existed", and "respondents stated they did not have time for a long learning curve" in regards to a social media training program (O'Neill et al. 2011). O'Neill et al. also found that "forty-five respondents were collectively able to reach almost 6,000 followers" (O'Neill et al. 2011). Through the process of the online survey, O'Neill et al. was able to determine powerful implications of social media adoption within a population. The study presented findings relative to our study in terms of use and policy, however its scope specifically did not incorporate demographic data.

In 2012, Wolf et al. produced a case study regarding the use of social media to enhance learning in higher education settings. A survey was used for the research to determine the usefulness of social media in the classroom. The study found that "students participating in the alpha test of the new social news platform, ValuePulse,

experienced learning enhancement by collaborating with classmates and discussing industry news" (Wolf et al. 2012). The sample "perceived that they had improved critical thinking skills, written communication skills, and know more about their field of study" (Wolf et al. 2012). The case study found that knowledge management through social media "enhance[s] learning", and made the students "feel more connected to [their] professor and classmates than using traditional communication methods" (Wolf et al. 2012). If social media participation also enhances the education and education of cooperative members, then Wolf et al. provides a strong argument for cooperatives considering adopting alternative communication methods to reach their customers.

CHAPTER III

METHODOLOGY

Survey Development

This study conducts market research of the Texas cooperative industry through a written and electronic survey process of Texas cooperatives. The sample size of the survey was derived from the list of cooperatives operating within the state of Texas provided by the Texas Agricultural Cooperative Council. TACC personnel estimate that the given list accounts for 95% of all active cooperatives within the state. A total of 32 questions were developed to accomplish the objectives of the survey. Notably, Communications Manager for Producers Cooperative Association, Kent Dunlap, and Executive Vice President of TACC Tommy Engleke, contributed the industry expertise that guided the creation of the survey questions. The questions were designed to include discrete, categorical, ordinal categorical, and continuous data. The use of varying questions was intended to capture the spectrum of those least likely to be open to adopting new technology, to those most likely to adopt new technology.

The survey was created and distributed in both printed and electronic formats to the entire sample. Providing identical alternate response avenues in this way avoids selection bias consistent with providing only an electronic response avenue when measuring technology adoption. The paper survey option preserved the integrity of the study by providing feedback from those hypothesized to be less likely to adopt new technology. The printed survey was mailed to every cooperative on the TACC list located within the state of Texas, along with a pre-stamped return envelope. The cover

page of the survey contained a URL linked to the online survey. The URL takes respondents to an identical survey posted by the Texas A&M AgriLife Extension Service's Qualtrics survey software. A similar invitation to take the survey online was delivered via email to each potential respondent.

Factor Analysis

Factor analysis is a method utilized to reveal the underlying constructs that affect a set of variables. The central idea on which it is based is that internal attributes affect surface attributes in a systematic fashion. These internal attributes are in some sense more fundamental than surface attributes. It involves a set of techniques designed to identify order and structure in data by providing parsimonious and meaningful explanations for the observed variation and covariation in surface attributes in a systematic fashion (Tucker and MacCallum 1997).

In practice, factor analysis is utilized to reduce the number of explanatory variables. For example, in our study there are a number of questions regarding various aspects of the cooperative. The responses to many of these questions are likely to be correlated. Factor analysis leads to the creation of indices, which are composed of correlated variables. It can be used to create a set of uncorrelated indices that can be used in regression analysis.

There are two types of factor analysis: confirmatory factor analysis and exploratory factor analysis. Confirmatory factor analysis is used to verify our initial assumptions about the factors that affect a set of variables. The method tests if a specified set of structures influence responses in a predicted way. Exploratory factor

analysis on the other hand attempts to discover the nature of constructs that influence a set of responses (Torres-Reyna). In this study, we employed the exploratory factor analysis method to discover the variables that influence various responses on the state of an agricultural cooperative and their willingness to adopt technology.

A factor analysis was conducted in order to lower the number of variables by creating indexes (Torres-Reyna) for the regression models. The data received from the survey was compiled in Excel and uploaded into Stata 11 for analysis. The following seven steps for conducting factor analysis were used for this study:

(1) Collect data for the analysis. The variables should be measured on the same (or matched) experimental units (DeCoster 1998).

(2) Obtain the correlation matrix between each of the variables.

(3) Select the number of factors for inclusion into the model. If there are K number of variables included into the model, there can be an utmost *K* number of factors that account for these variables. To determine the optimal number of factors, the factors in the correlation matrix must present eigenvalues greater than one to satisfy the Kaiser criterion (DeCoster 1998)

(4) Extract the initial set of factors.

(5) Rotate the factors for the final solution. This study performed an orthogonal rotation to create uncorrelated factors and to provide the most meaningful interpretation of factors, while still accounting for the same amount of covariation amongst variables as the original specification (DeCoster 1998).

(6) Interpret the factor structure based upon the strength of the relationship of the respective factor loading produced by the rotation (DeCoster 1998).

(7) Construct factor scores for further analyses in the logit and ordered logit models. The factors will be used as the independent variables in this study.

In the survey, the variables used for step (1) were located in one of four of the following categories: Manager Background, Cooperative Background, Cooperative Use or Concerns and Policies (Appendix A). Following the analysis of steps (2) through (7), the factor analysis produced the following four factors used in the estimation of the dependent variables: manager characteristics, attitude toward the value of communication technology, cooperative characteristics, and concerns about the use of social media.

The first factor, manager characteristics, included the respondent variables age, years at current employer, and years working for cooperatives, which provided discrete data describing cooperative managers. The second factor, attitude toward value of communication technology, included the respondent variables associated with questions 5, 6, 7, 8, 9, 10, and 11 in the survey (Appendix A), which represent ordinal categorical data recorded describing the managers' perceptions of value of communication and information technology. The third factor, cooperative characteristics, included the respondent variables associated with questions 14, 15, 16, 17, 18 in the survey (Appendix A), which represent discrete data recorded describing the structure of the cooperative. Finally, the fourth factor, cooperative concerns about social media, included the respondent variables associated with the questions 26, 27, 28, 29, and 30 in the

survey (Appendix A), which represent the managers' concern about social media use. The four factors satisfied the Kaiser criterion with eigenvalues greater than one, and all others were not used in the study for consistency. Combined with four other right hand side variables (table 1), the factors provided 77 observations for the logit and ordered logit models.

Logit and Ordered Logit

This study incorporated a discrete choice model due to the design of the survey. According to Train, "discrete choice models describe decision makers' choices among alternatives" (Train 2009). The study incorporated a discrete choice model because the survey format fulfills Train's three criterion for the set of alternatives or "choice set": the alternatives must be mutually exclusive, the choice set must be exhaustive of all possibilities, and the number of alternatives must be finite (2009).

Table 1 describes the relationship between the factors created and the coded independent variables used to estimate the logistic and ordered logistic regressions.

Table 1. Variable Coding for the Estimated Equations.

Variable	*Description*	*Stata Code Name*
Cooperative Employs an Information Technology Specialist	Dependent variable regarding the employment of an IT specialist or not.	yIT
Cooperative Plans to Use Social Media to Communicate With Members	Dependent variable regarding the level of agreement with using social media to communicate with members.	ySM
Manager Characteristics	Data denoting the respondent's age, years working in the industry, and years working for their current employer.	ManagerCha~s

Table 1. Continued.

Variable	*Description*	*Stata Code Name*
Attitude Toward the Value of Communication Technology	Data denoting the respondent's level of agreement associated with the value of communication technology.	AttToValue~h
Cooperative Characteristics	Data denoting the cooperative's estimated service radius, estimated annual gross revenue, number of members, and number of full time and seasonal employees.	Cooperativ~s
Concerns About Social Media	Data denoting the concerns about communicating with members via social media.	Concernsab~a
Average Hours Spent Online Per Day	Data denoting how many hours a day the respondent spent online.	averagehou~y
Cooperatives Providing Only Cotton Ginning Services	Data denoting if the respondent's cooperative only provides cotton ginning services	cottonginr~1
Cooperatives providing Only Utility Services	Data denoting if the respondent's cooperative only provides utility services.	utilitymem~1
Respondent Knows the Provided Internet Speed	Data denoting the knowledge of internet download speed in the cooperative.	mbpsknowle~e

For the purposes of the study, the logit model was chosen to explain the communication technology adoption behavior of Texas cooperatives. The logit was chosen given the binary response of the question (yes or no), and its working ability to be readily interpretable (2009). The logit model can be defined as:

$$(1) \qquad Prob\,(y = 1) = \frac{e^{\beta' x}}{1 + e^{\beta' x}} = \lambda\,(\beta' x)$$

Where $\lambda(.)$ indicates the logistic cumulative distribution function (Greene and Hensher 2009).

For our analysis, we consider the probability that a cooperative has a dedicated IT employee through the following regression:

(2) $$Prob\ (yIT = 1|\ \boldsymbol{x}) =$$

$$\lambda\ (\beta_0 + \beta_1\ Manager\ Characteristics +$$

$$\beta_2\ Attitude\ Toward\ the\ Value\ of\ Communication\ Technology +$$

$$\beta_3\ Cooperative\ Characteristics +\ \beta_4\ Concerns\ About\ Social\ Media +$$

$$\beta_5\ Average\ Hours\ Spent\ Online\ Per\ Day +$$

$$\beta_6\ Cooperatives\ Providing\ Only\ Cotton\ Ginning\ Services +$$

$$\beta_7\ Cooperatives\ Providing\ Only\ Utility\ Services +$$

$$\beta_8\ Repondent\ Knows\ the\ Provided\ Interent\ Speed)$$

We used question 19 as a dependent variable in the analysis to find what data is driving the best explains a cooperatives willingness to adopt communication technology (Appendix A). Question 19 prompted a binary response from the following statement: "do you have an employee dedicated to communication and information technology" (Appendix A). According to Greene, probit and logit discrete choice models are both equally suitable to estimate binary data, but the coefficients of the logit model are more easily interpretable.

This study also employed an ordered logit model to estimate the probabilities associated with the cooperative using social media to communicate with customers. An ordered logit model was appropriate because of the independent variable's Likert scaled responses. In this case we must consider our variable, *y* is actually a function of another variable *y** that is not measured, but has various threshold points that are observed.

Thus, our thresholds can be identified by, and we assume a standard logistic distribution of the residuals (Greene and Hensher 2009).

(3) $$Prob\ (y_i > j) = \frac{e^{\beta_j x_i}}{1+ e^{\beta_j x_i}}, j = 0,1, \ldots J-1,$$

Using this ordered logit, we estimate the likelihood of the cooperative using social media explained by our same right hand side variables. Once again, the likelihood of the event of cooperatives using social media to communicate with members is described by the estimation.

The dependent variable used to explain cooperative manager's attitudes towards technology adoption was chosen from question 12 of the survey. Question 12 prompted the respondent to agree or disagree to the following statement in a five-part scaled response ranging from strongly disagree to strongly agree: "we are currently using or are planning to use social media for communicating with cooperative members". According to Greene and Hensher, if the dependent variable is scaled, then an ordered logit model will explain the data the best of the discrete choice models (Greene and Hensher 2009).

Once the data were grouped into indexes from the factor analysis, the data were used to describe the two dependent variables. The Stata commands *ologit* and *logit* were employed to create the ordered logit and logit regression equations, respectively.

CHAPTER IV

RESULTS

The interpretations of this study are derived from the summary statistics generated from the raw data collected from the survey process, as well as the results from the discrete choice models. The summary statistics satisfy the objective of producing educational benchmarks for the Texas cooperative industry, and the logit and ordered logit analyses help illuminate our understanding of Texas cooperatives' willingness to adopt new forms of communication and information technology.

Summary Statistics

Summary statistics were generated from a 33% response rate, or 105 out of 312 cooperatives in the survey population. In terms of data collection, 37% of the responses were recorded electronically, with one response completed via mobile device. Of the 105 total responses, 82 respondents were members of the TACC. Utility cooperatives made up 24 of the responses, with 14 of them being TACC members. Cotton gins were represented by 18 respondents, all of which belonged to TACC.

Defining the Background of the Manager

Table 2 represents the summary statistics for the Manager Background section of the survey. The discussion of table 2 is broken down into outlining manager characteristics, manager and cooperative technology adoption behavior, daily internet usage, and management practices within the cooperative.

On average, the respondents are 52 years old, have worked at a cooperative for 21 years, and have been working at their current cooperative for nearly 15 years. The

median manager is 53 years old, has worked in a cooperative for 20 years, and has been at their current cooperative for 11 years. The youngest manager is 23 years old, 1 year was the shortest amount any respondent had been working for cooperatives, and the shortest amount of time any respondent had been a manager for their current cooperative was 7 months. The oldest manager is 72 years old, 50 years was the longest time any respondent had been working for cooperatives, and the longest time any respondent had been a manager for their current cooperative was 46 years. The standard deviation for manager age was 10 years, 12 years for the number of years the respondents worked for cooperatives, and nearly 12 years for the years respondents had been working for their current cooperative.

When respondents were asked to identify their own technology adoption behavior, as well as their cooperative's technology adoption behavior, the average and median manager classified themselves as being an early adopter (willing to try a new idea), and their cooperative to be in the early majority (willing to tolerate risk of adoption) (table 2). Responses for both personal and cooperative technology adoption behavior ranged from early adopter (first to try out a new idea) to laggard (last to adopt and very risk averse) (table 2). The standard deviation for personal and cooperative technology behavior was 1.02 and 1.07, respectively (table 2).

The average respondent spends 3.5 hours online a day, which is slightly higher than the median respondent who spends 3 hours online a day (table 2). The shortest amount of time a manager spent online a day is 1 hour, and the longest is 15 hours. The standard deviation for the amount of time online was 2.36 hours.

Respondents were asked to identify their current technology use for personal and business purposes. Personally, 93% of managers use a smart phone or cell phone, 36% use a tablet computer, 22% use a form of e-Book reader, 81% use a laptop or desktop computer, 3% use a netbook, 67 % use a digital camera, 46% use a Blu Ray or some form of DVD player, and 9% use a digital projector (table 2). The standard deviations for the personal use data regarding managers who use a smart phone or cell phone is .25, .48 for those who use a tablet computer, .42 for those who use a form of e-Book reader, .39 for those who use a laptop or desktop computer, .17 for those who use a netbook, .47 for those who use a digital camera, .50 for those who use a Blu Ray or some form of DVD player, and .28 for those who use a digital projector (table 2). For business purposes, 96% of managers use a smart phone or cell phone, 37% use a tablet computer, 5% use a form of e-Book reader, 83% use a laptop or desktop computer, 3% use a netbook, 50 % use a digital camera, 10% use a Blu Ray or some form of DVD player, and 31% use a digital projector (table 2). For standard deviations for the business use data regarding managers who use a smart phone or cell phone is .19, .49 for those who use a tablet computer, .21 for those who use a form of e-Book reader, .38 for those who use a laptop or desktop computer, .17 for those who use a netbook, .50 for those who use a digital camera, .31 for those who use a Blu Ray or some form of DVD player, and .47 for those who use a digital projector (table 2).

Finally, the survey further identified the background of the respondents by prompting them to indicate their level of agreement (strongly disagree to strongly agree) with statements regarding management practices (Appendix A). Managers' responses

ranged from strongly disagreeing to strongly agreeing with the management practice statements (table 2). The average and median manager agreed that marketing to customers beyond word of mouth is essential to the success of their business, strongly agreed that member/customer engagement was essential to the success of their business, agreed that they would only adopt user friendly forms of new technology, agreed that adopting new forms of technology would make their business more competitive, agreed that they needed to develop better lines of communication to fully engage their members, disagreed that they could fully engage customer interest through word of mouth, agreed that the use of social media could be an effective means of communicating with members, and neither agreed nor disagreed (remained neutral) that they are currently using or are planning to use social media to communicate with their members (table 2). To better visualize the distribution of the data, the standard deviation of the data in regards to considering if marketing to customers beyond word of mouth was essential to the success of the business was .85, .52 in regards to considering if member/customer engagement was essential to the success of their business, .78 when considering if managers would only adopt user friendly technology, .93 when considering if the adoption of new forms of communication technology would make the business more competitive, .81 when considering the necessity of developing better lines of communication for the business to fully engage customers, 1.04 when considering if the business could fully engage members through word of mouth, .86 in regards to using the internet and social media as an effective means to communicate with members, and

1.07 when asking managers if they were currently using or planning on using social media to communicate with cooperative members (table 2).

Table 2. Manager Background Summary Statistics.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
Age	105	51.63	53	24	72	10.46
Years At Current Employer	105	14.57	11	0.66	46	11.69
Years Working for Cooperatives	104	20.95	20	1	50	12.21
Personal Tech Adoption Behavior	74	2.50	2	1	5	1.02
Co-op Tech Adoption Behavior	74	2.68	3	1	5	1.07
Average Hours Online a day	102	3.50	3	1	15	2.36
Smart Phone/Cell Phone Personal	105	0.93	1	0	1	0.25
Smart Phone/Cell Phone For Business	105	0.96	1	0	1	0.19
Tablet Personal	105	0.36	0	0	1	0.48
Tablet For Business	105	0.37	0	0	1	0.49
Kindle/Nook/e-Book Reader Personal	105	0.22	0	0	1	0.42
Kindle/Nook/e-Book Reader For Business	105	0.05	0	0	1	0.21
Laptop/Computer Personal	105	0.81	1	0	1	0.39
Laptop/Computer For Business	105	0.83	1	0	1	0.38
Netbook Personal	105	0.03	0	0	1	0.17
Netbook For Business	105	0.03	0	0	1	0.17
Digital Camera Personal	105	0.67	1	0	1	0.47
Digital Camera For Business	105	0.50	1	0	1	0.50
Blu Ray & DVD Personal	105	0.46	0	0	1	0.50
Blu Ray & DVD For Business	105	0.10	0	0	1	0.31
Digital Projector Personal	105	0.09	0	0	1	0.28
Digital Projector For Business	105	0.31	0	0	1	0.47
Marketing to Customers Beyond W-O-M is Essential	105	4.14	4	2	5	0.85
Member/Customer Engagement is Essential	105	4.57	5	3	5	0.52
Only Adopt User Friendly Tech	105	3.90	4	1	5	0.78

Table 2. Continued.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
New Forms of Tech Make Us Competitive	105	3.94	4	1	5	0.93
Must Develop Better Lines of Communication	105	4.24	4	1	5	0.81
Can Fully Engage Customer Through WOM	105	2.47	2	1	5	1.04
Use of Social Media Is Effective Communication With Members	105	3.99	4	1	5	0.86
We Use/Planning to Use Social Media to Communicate With Members	105	3.43	4	1	5	1.07

Defining the Background of the Cooperative

Table 3 represents the summary statistics for the Cooperative Background section of the survey. The discussion of the summary statistics is broken down into outlining the relationship of the cooperative with its members, descriptive characteristics of the cooperative, and information regarding the use of internet in the cooperative.

The relationship with the members was coded on a scale of 1 to 7, where 1 indicated the cooperative's members were their supplier selling to the cooperative, 2 indicated the cooperative's members were customers purchasing goods, 3 indicated the cooperative provided business services for their members, 4 indicated any other relationship the cooperative held with their customers, 5 indicated that the cooperative's members were both a supplier selling to the cooperative and were customers purchasing goods, 6 indicated the cooperative's members were suppliers selling to the cooperative and the cooperative provided them with a business service, and 7 indicated the cooperative's members were customers purchasing goods and the cooperative provided

them with a business service (Appendix A). The median cooperative provided business services such as cotton ginning or utilities to its members (table 3). The standard deviation for the data outlining the cooperative business' relationship with its customers was 1.86 (table 3).

The average cooperative has its furthest member 148.5 miles away from the business, generates $67,165,874.13 in estimated gross revenue over a year, has 3,518 stockholders, employs 103 workers full time, and takes on 21 more employees seasonally (table 3). The median cooperative has its furthest member 60 miles away from the business, generates $12,000,000 in estimated gross revenue over a year, has 316 stockholders, employs 25 workers full time, and takes on 10 more employees seasonally (table 3). The range of the cooperative characteristics reported the furthest member from 15 to 2,000 miles away from the cooperative, $350,000 to $1,500,000,000 in estimated gross revenue annually, 20 to 35,000 stockholders, 2 to 6,000 full time employees, and 0 to 250 seasonal employees. The standard deviation for the characteristics cooperative portray 261.54 miles for the furthest member, $226,125,023.9 in estimated gross revenue annually, 6,959 stockholders, 592 full time employees, and 33 seasonal employees (table 3).

On average, 46% of cooperatives have an employee dedicated to information technology, are willing to pay 3.13% of their annual operating budget on communication and information technology; 97% of cooperatives have internet access with a speed of 6-10 megabits per second, 69% knew the speed of their internet at the cooperative, 81% of the cooperatives provide internet for their employees, and 52% of cooperatives provided

internet for their customers (table 3). The median cooperative did not have an employee responsible for information technology, is willing to spend 1.7% of their annual operating budget on communication and information technology, has internet access in the cooperative which is more than 10 megabits per second, knew the speed of their internet provided in the cooperative, and provided internet for both employees and customers (table 3). The range of this data ranges from 0 to 1 (yes or no) for cooperatives having an employee dedicated to information technology, 0% to 35% in willingness to pay out of the annual operating budget for communication and information technology, 0 to 1 (yes or no) access to the internet provided by the cooperative, 1 to 3 (1-5 mbps, 6-10 mbps, 10+ mbps) for internet speed provided at by the cooperative, and 0 to 1 (yes or no) in regards to knowing the speed of the available internet and if its provided to employees and customers use (table 3). The data displays a standard deviation of .5 in regards to an employee focused on technology information, 5.27% in regards to willingness to pay of the annual operating budget for communication and information technology, .17 in regards to cooperative internet access, .8 for variations in internet speed, .47 in knowing what the speed of the available internet is, .4 in regards to internet being available to employees, and .5 pertaining to internet being available to customers (table 3).

Table 3. Cooperative Background Summary Statistics.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
Relationship With Members	105	3.71	3	1	7	1.86
Furthest Member (Miles)	103	148.05	60	15	2000	261.54

Table 3. Continued.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
Estimated Gross Revenue ($)	93	67,165,874.97	12,000,000	350,000	1,500,000,000	226,125,023.9
# Of Stockholders	98	3517.89	316	20	35000	6959.01
# Of Full Time Employees	103	103.37	15	2	6000	591.69
# Of Seasonal Employees	101	20.92	10	0	250	32.61
Employee Dedicated to IT	103	0.46	0	0	1	0.50
W-T-P of Budget on Tech (%)	59	3.13	1.7	0	35	5.27
Co-op Internet Access	105	0.97	1	0	1	0.17
Internet Speed (MBPS)	72	2.32	3	1	3	0.80
MBPS Knowledge	105	0.69	1	0	1	0.47
Internet Available for Employees	104	0.81	1	0	1	0.40
Internet Available for Customers	105	0.52	1	0	1	0.50

Defining Cooperative Use of Communication and Information Technology

Table 4 describes the statistics related to the practice of communication and information technology within Texas cooperatives. On average, 32% of cooperatives advertise over the internet, 24% of cooperatives employ an internet marketing or promotion program, 93% hold an annual meeting to communicate to members, 65% of cooperatives use newsletters or publications to communicate with members, 56% employ print advertising, 16% have a television advertising campaign, 3% provide educational podcasts, 38% field days or “Short-Courses” for their members, 24% employ a Facebook social media campaign, 10% communicate to members through

Twitter, 3% use LinkedIn to connect with members, 70% communicate with members through email, 49% text message their members, 66% maintain a website monthly, and 54% provide some sort of technology to their Board of Directors (BOD) and/or employees (table 4). The median cooperative does not advertise to its member over the internet, does not market to their members over the internet, hold an annual meeting for their members, creates a newsletter or some form of publication to reach its members, advertises to customers in print, does not advertise via television, does not produce an educational podcast, does not put on a field day or "Short Course" for their members, can not be found on Facebook, does not use Twitter to communicate to members, does not reach its members through LinkedIn, does send email notifications with its members, does not engage in text message conversations with its members, does maintain a website for members which is done monthly, and does provide technology to its BOD and/or employees (table 4). The responses for this section of the survey range from 0 to 1 (yes or no) in regards to cooperatives advertising via internet, marketing via internet, holding annual meetings for members, producing newsletters or publications for members, advertising via print, advertising via television, providing an educational podcast, holding a field day or "Short Course" for members, being on Facebook, being on Twitter, being on LinkedIn, emailing members, texting members, maintaining a website, and providing technology to BOD and/or employees (table 4). The data ranges from 1 to 4 (Daily, Weekly, Monthly, Not done on a regular basis) in regards to how often the cooperative's website is updated (table 4). The data for this section reflected a standard deviation of .47 for advertising via internet, .43 for marketing via internet, .25

for annual meetings being provided, .48 for newsletters or publications being produced, .5 for advertising via print form, .37 for advertising via television, .17 for educational podcasts being provided, .49 for field days of "Short Courses" being held, .43 for being on Facebook, .31 for being on Twitter, .17 for being on LinkedIn, .46 for sending emails to members, .5 for texting members, .48 for maintaining a website, 1.09 for how often that website is updated, and .50 for providing technology to the BOD and/or employees (table 4).

Table 4. Cooperative Use Summary Statistics.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
Internet Advertising	105	0.32	0	0	1	0.47
Internet Marketing/Promotion	105	0.24	0	0	1	0.43
Annual Meeting	105	0.93	1	0	1	0.25
Newsletter/Publications	105	0.65	1	0	1	0.48
Print Advertising	105	0.56	1	0	1	0.50
Television Advertising/Media	105	0.16	0	0	1	0.37
Educational Podcasts	105	0.03	0	0	1	0.17
Field Days/Cooperative Sponsored "Short Courses"	105	0.38	0	0	1	0.49
Facebook	105	0.24	0	0	1	0.43
Twitter	105	0.10	0	0	1	0.31
LinkedIn	105	0.03	0	0	1	0.17
Email	105	0.70	1	0	1	0.46
Text Messaging	105	0.49	0	0	1	0.50
Website Maintained	103	0.66	1	0	1	0.48
Website Updated	70	2.63	3	1	4	1.09
Provide Tech to BOD and/or Employees	104	0.54	1	0	1	0.50

Defining Cooperative Concerns and Policies of Communication and Information Technology

Table 5 describes the statistics related to the concerns and policies of communication and information technology of Texas cooperatives. The discussion of the summary statistics is broken down into outlining cooperative concerns, followed by cooperative policies.

On average and median, cooperatives agreed that personal use of social media is not appropriate, neither disagreed or agreed (are neutral) that a cooperative sponsored social media account will be received poorly, are neutral on whether the cooperative will receive bad publicity through the use of social media or not, are neutral about the clarity of the objectives a social media campaign will accomplish, and are neutral on whether too much information is shared with competitors through social media or not (table 5). The range of responses regarding cooperative concerns ranges from 1 to 5 (strongly disagree to strongly agree) (table 5). The standard deviation of the data in regards to the appropriateness of the personal use of social media is .88, .99 for a cooperative social media account will be received poorly by members, .84 on whether social media brings negative publicity or not, .96 on whether a cooperative social media campaign objectives are unclear or not, and .92 in regards to social media sharing too much information with competitors (table 5).

In regards to average cooperative policies of communication and information technology, 31% provide a text messaging policy, 29% provide a chat platform policy, 43% provide an email policy, 49% provide a personal phone use policy, 23% provide a

social media policy, and 38% do not provide any communication and information technology policy (table 5). In terms of the median of the data, cooperatives do not have a policy defining the use of text messaging, chat platforms, emailing, personal phone use, or social media use in the cooperative (table 5). The responses for the data in regards to cooperative communication and information technology range from 0 to 1 (yes or no) (table 5). The standard deviation of the data is .47 in regards to a text messaging policy, .45 in regards to a chat platform policy, .5 in regards to an email policy, .5 in regards to a personal phone use policy, .42 in regards to a social media policy, and .49 for not having any policy for communication and technology information use in the cooperative (table 5).

Table 5. Cooperative Concerns and Policies Summary Statistics.

Variable	*N*	*Mean*	*Median*	*Min*	*Max*	*Standard Deviation*
Personal Social Media Not Appropriate	104	3.71	4	1	5	0.88
Cooperative Social Media Received Poorly	103	2.85	3	1	5	0.99
Social Media Brings Negative Publicity	104	2.67	3	1	5	0.84
Social Media Objectives Are Unclear	104	3.25	3	1	5	0.96
Social Media Shares Info With Competitors	102	3.00	3	1	5	0.92
Text Messaging Policy	105	0.31	0	0	1	0.47
Chat Platform Policy	105	0.29	0	0	1	0.45
Email Policy	105	0.43	0	0	1	0.50
Personal Phone Policy	105	0.49	0	0	1	0.50
Social Media Policy	105	0.23	0	0	1	0.42
None of the Above	104	0.38	0	0	1	0.49

Logit & Ordered Logit

Table 6 shows the results from the logistic regression. The model proves wellness of fit through a chi-square value of 35.42 with 8 degrees of freedom. The chi-square test needs to show a probability less than .05 to be declared significant. With 75 observations, the estimation of cooperatives' likeliness to hire an information technology specialist can be best explained by the factors representing cooperative characteristics and concerns about social media (table 6). These factors satisfy the z-value and p-value criterion at the 90% confidence interval (table 6). The cooperative characteristics and concerns about social media factors significant z-values are 1.77 and -1.87, respectively (table 6). The cooperative characteristics and concerns about social media factors also exhibit significant p-values of .077 and .061, respectively (table 6). The coefficients of the logistic regression are expressed in terms of log-odds in table 6; however, their implications will be discussed in a more interpretable manner through odds ratios in table 7.

Table 6. Logistic Regression Results.

Logistic regression — Number of obs = 75; LR chi2(8) = 35.42; Prob > chi2 = 0.0000; Log likelihood = -32.765235; Pseudo R2 = 0.3509

yIT	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ManagerCha~s	.0470065	.3769935	0.12	0.901	-.6918872	.7859002
AttToValue~h	.337052	.5187451	0.65	0.516	-.6796698	1.353774
Cooperativ~s	3.410199	1.927268	1.77	0.077	-.367177	7.187574
concernsab~a	-.8977206	.4796414	-1.87	0.061	-1.8378	.0423592
averagehou~y	.1028434	.1287622	0.80	0.424	-.1495258	.3552126
cottonginr~l	-1.750232	1.215041	-1.44	0.150	-4.131668	.6312046
utilitymem~l	1.765239	1.09165	1.62	0.106	-.3743562	3.904835
mbpsknowle~e	.7183789	.7849429	0.92	0.360	-.8200809	2.256839
_cons	.2978696	2.995895	0.10	0.921	-5.573977	6.169716

Table 7 displays the odds ratios derived from the logistic regression's coefficients. The odds ratios can be interpreted as the probability of the dependent variable occurring (the cooperative employing an information technology specialist) due to the increase in one unit of the corresponding independent variable, *ceteris paribus*. If the odds ratio is less than 1, then the variable has a negative influence on the likelihood of the cooperative employing an information technology specialist (Newsom 2011). If the odds ratio is equal to 1, than the variable has no influence on the likelihood of the cooperative employing an information technology specialist (2011). If the odds ratio is greater than 1, the variable has a positive influence on the likelihood of the cooperative employing an information technology specialist (2011). If the manager's characteristics had been increased by one (age, years working at the cooperative, years working for a cooperative), the cooperative is 1.04 times more likely to employ an information technology specialist (table 7). If the cooperative increased their level of agreement towards the value of adopting communication technology by one (strongly disagree = 1; strongly agree=5), the cooperative is 1.4 times more likely to employ an information technology specialist (table 7). If the cooperative increased their characteristics by one (service radius, annual gross revenue, number of stockholders, number of full-time and seasonal employees), it is 30.27 times more likely to employ an information technology specialist (table 7). If the cooperative increased their level of agreement with the use of social media by one (strongly disagree = 1; strongly agree = 5), it is .4 times more likely to employ an information technology specialist (table 7). If the manager spent one more hour online per day, the cooperative is 1.1 times more likely to employ an information

technology specialist (table 7). If the number of cooperatives that only participate in cotton ginning increased by one, the cooperative is .17 times more likely to employ an information technology specialist (table 7). If the number of cooperatives that only participate in providing utilities increased by one, the cooperative was 5.84 times more likely to employ an information technology specialist (table 8). If the number of managers that are aware of the speed of the internet (mbps) being used in the cooperative increased by one, the cooperative is 2.05 times more likely to employ an information technology specialist (table 7).

Table 7. Logistic Regression Odds Ratios.

Logistic regression — Number of obs = 75; LR chi2(8) = 35.42; Prob > chi2 = 0.0000; Log likelihood = -32.765235; Pseudo R2 = 0.3509

yIT	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ManagerCha~s	1.048129	.3951378	0.12	0.901	.5006304	2.194381
AttToValue~h	1.400812	.7266643	0.65	0.516	.5067843	3.87201
Cooperativ~s	30.27125	58.34082	1.77	0.077	.692687	1322.89
concernsab~a	.4074975	.1954526	-1.87	0.061	.1591671	1.043269
averagehou~y	1.108318	.1427094	0.80	0.424	.8611162	1.426484
cottonginr~l	.1737337	.2110935	-1.44	0.150	.0160561	1.879874
utilitymem~l	5.84297	6.37848	1.62	0.106	.6877319	49.64187
mbpsknowle~e	2.051106	1.610001	0.92	0.360	.440396	9.552843

Table 8 represents the probability of the event of the average cooperative to answer “yes” or “no” to having an employee dedicated to information technology. The average cooperative used in the equation is derived from finding the mean of the data pertaining to its associated factor (table 8). According to table 8, the probability of an average cooperative having an employee with job duties dedicated to information

technology is 40%. Likewise, table 8 also reports that there is a 59% probability that the cooperative does not have an employee solely dedicated information technology.

Table 8. Logistic Regression Probabilities.

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logit: Predictions for yIT

Confidence intervals by delta method

                              95% Conf. Interval
  Pr(y=1|x):          0.4054   [ 0.2156,    0.5951]
  Pr(y=0|x):          0.5946   [ 0.4049,    0.7844]

    ManagerCha~s  AttToValue~h  Cooperativ~s  concernsab~a  averagehou~y  cottonginr~l  utilitymem~l
x=     .02865211      4.346764    -.05821575     2.9933297     3.5466667     .18666667           .12

    mbpsknowle~e
x=           .68
```

Table 9 shows results from the ordered logistic regression. The model proves to be robust through a chi-square is 48.5 with 8 degrees of freedom. With 77 observations, the estimation of the cooperatives' likeliness to use social media can be explained by the factors representing managers' attitudes toward the value of communication technology and concerns about social media (table 9). These factors satisfy the z-value and p-value criterion at the 95% confidence interval. The factors pertaining to managers' attitudes toward the value of communication technology and concerns about social media exhibit significant z-values of 3.09 and -4.23, respectively (table 9). The factors also exhibit significant p-values of .002 and .000, respectively. The coefficients of the ordered logistic regression are expressed in terms of log-odds in table 9; however, their implications will be discussed in a more interpretable manner through odds ratios in table 10. The Ancillary parameters used in the estimation of probabilities for the independent variable values (1, 2, 3, 4, and 5) are as follows: -4.61, -3.03, -.85, and 2.69 (table 9).

Table 9. Ordered Logistic Regression Results.

Ordered logistic regression — Number of obs = 77; LR chi2(8) = 48.50; Prob > chi2 = 0.0000; Log likelihood = -78.400925; Pseudo R2 = 0.2362

ySM	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ManagerCha~s	.3745606	.2703166	1.39	0.166	-.1552503	.9043714
AttToValue~h	1.189429	.3852217	3.09	0.002	.4344086	1.94445
Cooperativ~s	.0363845	.4473659	0.08	0.935	-.8404365	.9132055
concernsab~a	-1.797535	.4247417	-4.23	0.000	-2.630014	-.9650569
averagehou~y	-.0888679	.0958758	-0.93	0.354	-.2767809	.0990452
cottonginr~l	.6444686	.6520912	0.99	0.323	-.6336066	1.922544
utilitymem~l	-.4023985	.8073563	-0.50	0.618	-1.984788	1.179991
mbpsknowle~e	-.1604207	.5467825	-0.29	0.769	-1.232095	.9112532
/cut1	-4.615903	2.341935			-9.206011	-.0257949
/cut2	-3.037692	2.285385			-7.516964	1.441581
/cut3	-.8540494	2.245904			-5.25594	3.547841
/cut4	2.698549	2.238921			-1.689657	7.086754

Table 10 displays the odds ratios derived from the ordered regression's coefficients. The odds ratios can be interpreted as the probability of the dependent variable occurring (the cooperative currently using or planning to use social media to communicate with members) due to the increase in one unit of the corresponding independent variable, *ceteris paribus*. If the manager's characteristics had been increased by one (age, years working at the cooperative, years working for a cooperative), the cooperative is 1.45 times more likely to use social media to communicate with their members (table 10). If the cooperative increased their level of agreement towards the value of adopting communication technology by one (strongly disagree = 1; strongly agree=5), the cooperative is 3.28 times more likely to use social media to communicate with their members (table 10). If the cooperative increased their characteristics by one (service radius, annual gross revenue, number of stockholders, number of full-time and seasonal employees), it is 1.03 times more likely to use social

media to communicate with their members (table 10). If the cooperative increased their level of agreement with the use of social media by one (strongly disagree = 1; strongly agree = 5), it is .16 times more likely to use social media to communicate with their members (table 10). If the manager spent one more hour online per day, the cooperative is .91 times more likely to use social media to communicate with their members (table 10). If the number of cooperatives that only participate in cotton ginning increased by one, the cooperative is 1.9 times more likely to use social media to communicate with their members (table 10). If the number of cooperatives that only participate in providing utilities increased by one, the cooperative was .66 times more likely to use social media to communicate with their members (table 10). If the number of managers that are aware of the speed of the internet (mbps) being used in the cooperative increased by one, the cooperative is .85 times more likely to use social media to communicate with their members (table 10).

Table 10. Ordered Logistic Regression Odds Ratios.

Ordered logistic regression — Number of obs = 77; LR chi2(8) = 48.50; Prob > chi2 = 0.0000; Log likelihood = -78.400925; Pseudo R2 = 0.2362

ySM	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ManagerCha~s	1.454352	.3931356	1.39	0.166	.8562008	2.470379
AttToValue~h	3.285205	1.265532	3.09	0.002	1.54405	6.989785
Cooperativ~s	1.037055	.4639428	0.08	0.935	.4315221	2.492299
concernsab~a	.1657068	.0703826	-4.23	0.000	.0720775	.3809615
averagehou~y	.9149665	.0877231	-0.93	0.354	.7582206	1.104116
cottonginr~l	1.904974	1.242217	0.99	0.323	.5306744	6.838332
utilitymem~l	.6687142	.5398906	-0.50	0.618	.1374098	3.254344
mbpsknowle~e	.8517853	.4657413	-0.29	0.769	.291681	2.487438
/cut1	-4.615903	2.341935			-9.206011	-.0257949
/cut2	-3.037692	2.285385			-7.516964	1.441581
/cut3	-.8540494	2.245904			-5.25594	3.547841
/cut4	2.698549	2.238921			-1.689657	7.086754

Table 11 represents the probability of the event of the average cooperative to answer “strongly disagree”, “disagree”, “neither agree or disagree”, “agree”, or “strongly disagree” to the cooperative use of social media. The average cooperative used in the equation is derived from finding the mean of the data pertaining to each of its associated factors (table 11). According to table 11, the probability of an average cooperative strongly disagreeing to using or planning to use social media to communicate with members is 1%, 5% to just disagree, 34%, to neither agree or disagree, 54% to agree, and 3% to strongly agree.

Table 11. Ordered Logistic Regression Probabilities.

```
ologit: Predictions for ySM

Confidence intervals by delta method

                              95% Conf. Interval
     Pr(y=1|x):       0.0163   [-0.0043,    0.0369]
     Pr(y=2|x):       0.0580   [ 0.0072,    0.1087]
     Pr(y=3|x):       0.3417   [ 0.2078,    0.4755]
     Pr(y=4|x):       0.5454   [ 0.4057,    0.6851]
     Pr(y=5|x):       0.0387   [ 0.0027,    0.0747]

    ManagerCha~s  AttToValue~h  Cooperativ~s  concernsab~a  averagehou~y  cottonginr~l  utilitymem~l
x=     .03203196     4.3583962     -.0646104     2.9849723     3.5194805     .19480519     .11688312

    mbpsknowle~e
x=     .67532468
```

CHAPTER V

CONCLUSIONS

In conclusion, the data gathered by this study generated useful benchmarks of communication and information technology adoption behaviors and use in the Texas cooperative industry. This study can be used as a new starting point for further research regarding technology adoption in the agricultural sector, and the results provide insight into management styles within the industry for cooperative managers.

Reflecting on cooperative managers characteristics, the high average and median regarding the years the manager had worked at their current cooperative suggests the validity of the study. Many respondents had spent a large proportion of their career with a single employer. This longevity suggests that the management styles and behaviors reported in the survey were an accurate snap shot of what has been taking place in the industry. The background of cooperatives was well represented with a response from all sizes of cooperatives. The ranges of estimated annual gross revenue ranged from the hundred of thousands to billions, which hints at a wide array of cooperative business responses. For the most part, cooperative use of communication and information technology was limited to more traditional forms of communication, and reflecting little widespread use of newer forms communication technology. Managers seemed to be more likely to remain neutral when it came to implementing a social media strategy into their management practices. In regards to the question, “what is the single most important factor that keeps you from implementing a social media strategy”, a median write-in answer reflected an overall lack of time and know-how. Conversely, nearly

every respondent indicated a willingness to devote resources out of the annual operating budget to develop a social media campaign. Texas cooperative managers seem to be willing to expand on their current use of communication technology, however a clear definition of how to use new concepts as a powerful tool is needed. In terms of governance, we found that many cooperatives have no stated policies regarding the use of communication technologies. Generally, those cooperatives that had defined technology use policies were more likely to be using more forms of technology. The lack of formal policies is disconcerting given the resulting increase in liability exposure.

The logistic and ordered logistic regressions did not reflect our initial expected results. We initially hypothesized the age of the respondent and the years working for a cooperative (manger characteristics) would be negatively correlated with the adoption of communication technology, driving it to be a significant factor in estimating Texas cooperatives' willingness to adopt new forms of communication technology and social media. However, the cooperatives' technology adoption behavior can best be explained by the data produced from descriptive cooperative information and the existence of employee communication technology policies. Likewise, cooperatives' willingness to adopt social media can best be explained by the data produced from manager attitudes and cooperatives' concerns. Many written observations reflected a high frequency of managers explaining that time and know how were the main factors restricting them from starting a social media campaign. However, nearly all respondents were willing to devote a portion of their annual operating budget for the production and maintenance of

a social media campaign. This relationship specifically highlights an identified interest in further research and action.

This study leaves room for further research in the Texas cooperative industry. An overall need has been identified for communication and technology communication education and adoption, and an implementation strategy is in order. Social media campaigns can be tailored to each organization to help them find workable solution to communicate with their members and customers. Understanding the driving forces behind each cooperative's adoption of new technology will aid educators in developing educational materials to help progress the technological literacy of cooperatives and inspire improved customer/member interaction and involvement.

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APPENDIX A

SURVEY

TEXAS A&M UNIVERSITY HUMAN SUBJECTS PROTECTION PROGRAM
INFORMATION SHEET

Project Title: **An Assessment of Technology Adoption Behavior Of Texas Agricultural Cooperatives**

You are being invited to take part in a research study being conducted by The Texas AgriLife Extension Service regarding technology adoption behavior in Texas. The purpose of this form is to provide you with information that may affect your decision as to whether or not to participate in this research. You were selected to be a possible participant in this survey because you are listed as a member of the Texas Agricultural Cooperative Council.

WHAT WILL YOU BE ASKED TO DO?
If you agree to participate in this study, you will be asked to complete the enclosed survey and return it in the enclosed postage-paid envelope. This survey should take approximately 10 minutes to complete.

ARE THERE ANY RISKS TO ME?*
The risks to you in completing this survey are no greater than those encountered in daily life.

ARE THERE ANY BENEFITS TO ME?
There may be no direct benefit to you by participating in this study, but what the researchers find out may benefit you by adding to cooperatives' and Extension's understanding of technology adoption in recent years.

DO I HAVE TO PARTICIPATE?*
No. Your participation is completely voluntary. If you decide not to participate, your current or future relations with the Texas AgriLife Extension Service, Texas A&M University, or the Texas Agricultural Cooperative Council will not be affected.

WHO WILL KNOW ABOUT MY PARTICIPATION IN THIS STUDY?
This study is anonymous. All individual information collected will only be shared in aggregate form. Research records will be stored securely in the office of Dr. John Park. Information about you will be stored in locked file cabinet; computer files protected with a password. People who have access to your information include only Dr. John Park and his graduate student.

WHOM CAN I CONTACT FOR MORE INFORMATION ABOUT THIS STUDY?
You may contact the Principal Investigator for this study, Dr. John Park, by phone at:

- Phone number: (979) 845-1751
- Email: jlpark@tamu.edu

**You may email* irb@tamu.edu *for more information concerning your rights as a participant in research involving human subjects.*

Version Date: Page 1 of 1

AgriLIFE EXTENSION
Texas A&M System

ID

An Assessment of Communication Technology Adoption in Texas Cooperatives

A study conducted by…

Texas AgriLife Extension Service, and
Texas Agricultural Cooperative Council

This survey studies the adoption and use of information and communication technology by Texas agricultural cooperatives. We hope to achieve a better understanding of how cooperatives interact with their customers and a`chieve their business objectives through the adoption and use of cell phones, computers, social media, and more. We are confident that cooperative managers and directors will use this information to improve customer relations, allowing for easier growth.

Our promise to you…

- All data collected from the survey will only be shared in aggregate form,
- Your individual responses will never be shared,
- All individual surveys will be destroyed upon completion of the study,
- The data collected will be used to educate and train cooperative managers and directors.

The survey will take about ***10 minutes to complete***. We will share a copy of the results with survey participants. Just leave us the appropriate contact information at the end of the survey.

Don't want to hassle with mailing the survey back to us? Take the survey online at:

http://tinyurl.com/6t6t9hq

THANK YOU!

Questions? Please feel free to contact us:

Tommy Engleke
Texas Agricultural Cooperative Council
tommy@texas.coop
(512) 450-0555

Dr. John Park
Texas AgriLife Extension
jlpark@tamu.edu
(979) 845-1751

Matt Murch
Texas AgriLife Extension
murch28@gmail.com
(972) 672-5028

Name of cooperative: _____

Manager Background

1. Please indicate the following about yourself:

Age: _____ Years at current employer: _____ Years working for cooperatives: _____

2. How would you describe yourself and your cooperative in terms of technology adoption:

	You	Your Co-op
Innovators (First to try out new technology)	☐	☐
Early Adopters (Willing to try a new idea)	☐	☐
Early Majority (Willing to tolerate risk of adoption)	☐	☐
Late Majority (Have a wait-and-see attitude)	☐	☐
Laggards (Last to adopt, very risk averse)	☐	☐

3. On average, how many hours do **you** spend using the internet for business purposes during a typical work day?

_____ Hours

4. Which of the following do **you** use on a regular basis? *(Check all that apply)*

	Personally	For Business
Smart Phone/Cell Phone	☐	☐
Tablet (iPad/Android)	☐	☐
Kindle/Nook/e-Book Reader	☐	☐
Laptop/Computer	☐	☐
Netbook	☐	☐
Digital Camera	☐	☐
Blu Ray & DVD	☐	☐
Digital Projector	☐	☐

Indicate your agreement with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
5. Marketing to customers beyond word of mouth is essential to our success	☐	☐	☐	☐	☐
6. Member/customer engagement is essential to our success	☐	☐	☐	☐	☐
7. We will only adopt user friendly forms of new technology	☐	☐	☐	☐	☐
8. Adopting new forms of communication technology will make us more competitive	☐	☐	☐	☐	☐

ID

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
9. We must develop better lines of communication to fully engage our members	☐	☐	☐	☐	☐
10. We can fully engage member interest through word of mouth	☐	☐	☐	☐	☐
11. Use of the internet and social media can be an effective means of communicating with members	☐	☐	☐	☐	☐
12. We currently use or are planning to use social media for the communicating with cooperative members	☐	☐	☐	☐	☐

Cooperative Background

13. Please describe your relationship to your cooperative members: (*Check all that apply*)

☐ Our members are suppliers selling to the cooperative
☐ Our members are customers purchasing goods from the cooperative
☐ We provide business services for our members (like cotton ginning or utilities)
☐ Other _____

14. How far (in miles) is the furthest active member from your cooperative? (*Estimated service radius)* _____ *miles*

15. What is your ***estimated*** gross revenue in a ***typical*** year? _____

16. How many stockholders does your cooperative have? _____

17. How many full-time employees does your cooperative have? _____

18. How many seasonal employees does your cooperative have? _____

19. Do you have an employee dedicated to communication and information technology? ☐ Yes ☐ No

20. What percentage of your cooperative's annual operating budget are you willing to spend on communication and information technology? _____

21. Do you have internet access at the cooperative? ☐ Yes ☐ No ☐ I don't know

If "yes" please answer the following:

a. What is the download speed? (*Mbps*)

☐ 1-5 Mbps ☐ 6-10 Mbps ☐ 10+ Mbps ☐ I don't know

b. Do you have a wi-fi network? ☐ Yes ☐ No ☐ I don't know

c. Is the internet available for employee use at your cooperative? (*outside of administration)* ☐ Yes ☐ No ☐ I don't know

d. Is the internet available for customer use at your cooperative? ☐ Yes ☐ No ☐ I don't know

Cooperative Use

22. Which of the following does your cooperative use to communicate with members? (*Check all that apply*)

☐ Internet Advertising	☐ Print Advertising	☐ Facebook
☐ Internet Marketing/Promotion	☐ Television Advertising/Media	☐ Twitter
☐ Annual Meeting	☐ Educational Podcasts	☐ LinkedIn
☐ Newsletter/Publications	☐ Field Days/Cooperative Sponsored "Short-Courses"	☐ Email
☐ Text Messaging		

23. Does your cooperative maintain a website? ☐ Yes ☐ No

24. If yes, how often is the site updated?

☐ Daily ☐ Weekly ☐ Monthly ☐ Not done on a regular basis

25. Does your cooperative currently provide any technology to board directors and/or employees? ☐ Yes ☐ No

If "yes" please specify what is provided (Laptops,Smartphones, iPads, etc.):

_____

_____

Concerns and Policies

Please indicate if you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
26. Personal social media use is not appropriate at work.	☐	☐	☐	☐	☐
27. A cooperative sponsored social media account will be received poorly by members.	☐	☐	☐	☐	☐
28. The cooperative will receive bad publicity through its own social media	☐	☐	☐	☐	☐
29. The objectives a social media campaign will accomplish for your cooperative are unclear.	☐	☐	☐	☐	☐
30. Too much information is shared with competitors through social media	☐	☐	☐	☐	☐

31. What is the single most important factor that keeps you from implementing a social media strategy?

_____

_____

32. Please indicate which of the following are currently governed by employee policies *(Check all that apply)*:

ID

□Text Messaging
□Use of Chat Platforms (Facebook Chat, Google Chat, iChat, etc.)
□Email
□Phone use
□Social Media Accounts
□None of the above

-Thank You!-

APPENDIX B

STATA CODE FOR FACTOR ANALYSIS & DISCRETE CHOICE ANALYSIS

```
use "E:\Coop\7-23 Data.dta", clear


. do "E:\Coop\7-26 Do file.do"


. factor age yearsatcurrentemployer yearsworkingforcooperatives

(obs=104)


Factor analysis/correlation                       Number of obs    =      104
    Method: principal factors                     Retained factors =        1
    Rotation: (unrotated)                         Number of params =        3

    --------------------------------------------------------------------------
         Factor  |   Eigenvalue   Difference        Proportion   Cumulative
    -------------+------------------------------------------------------------
        Factor1  |      1.78921      1.84543            1.1507       1.1507
        Factor2  |     -0.05622      0.12194           -0.0362       1.1146
        Factor3  |     -0.17816            .           -0.1146       1.0000
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(3)  =  129.56 Prob>chi2 = 0.0000


Factor loadings (pattern matrix) and unique variances
```

```
    --------------------------------------
        Variable |  Factor1 |   Uniqueness
    -------------+----------+--------------
             age |   0.7078 |      0.4991
    yearsatcur~r |   0.7560 |      0.4285
    yearsworki~s |   0.8466 |      0.2832
    --------------------------------------


. rotate


Factor analysis/correlation                       Number of obs    =      104
    Method: principal factors                     Retained factors =        1
    Rotation: orthogonal varimax (Kaiser off)     Number of params =        3

    ------------------------------------------------------------------------------
         Factor  |     Variance   Difference        Proportion   Cumulative
    -------------+----------------------------------------------------------------
        Factor1  |      1.78921            .            1.1507       1.1507
    ------------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(3)  =  129.56 Prob>chi2 = 0.0000


Rotated factor loadings (pattern matrix) and unique variances
```

```
    --------------------------------------
        Variable |  Factor1 |   Uniqueness
    -------------+----------+--------------
             age |   0.7078 |      0.4991
    yearsatcur~r |   0.7560 |      0.4285
    yearsworki~s |   0.8466 |      0.2832
    --------------------------------------


Factor rotation matrix


    ----------------------
                 | Factor1
    -------------+--------
         Factor1 |  1.0000
    ----------------------


. predict cex
(regression scoring assumed)


Scoring coefficients (method = regression; based on varimax rotated factors)


    ------------------------
```

```
        Variable |  Factor1
-------------+----------
             age |  0.23438
    yearsatcur~r |  0.28595
    yearsworki~s |  0.49091
    -------------------------
```

```
. gen ManagerCharacteristics=cex

(1 missing value generated)
```

```
. *tetrachoric correlations are used because data is binary - we can not use Pearson's
correlation (default) matri

> x.*

. tetrachoric  smartphonecellphonepersonal  smartphonecellphoneforbusiness
tabletpersonal  tabletforbusiness  kin

> dlenookebookreaderpersonal  kindlenookebookreaderforbusiness  laptopcomputerpersonal
laptopcomputerforbusiness

>  netbookpersonal  netbookforbusiness  digitalcamerapersonal  digitalcameraforbusiness
blurayd vdpersonal blurayd

> vdforbusiness  digitalprojectorpersonal  digitalprojectorforbusiness

(obs=105)
```

```
matrix with tetrachoric correlations is not positive semidefinite;

  it has 5 negative eigenvalues
```

```
  maxdiff(corr,adj-corr) =  0.6315

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



             | smartp~l smartp~s tablet~l tablet~s kindle~l kindle~s laptop~l laptop~s
netboo~l netboo~s digita..

-------------+------------------------------------------------------------------------
------------------------

smartphone~l |   1.0000

smartphone~s |   0.4033   1.0000

tabletpers~l |   0.1081   0.1449   1.0000

tabletforb~s |  -0.0766   1.0000   0.7004   1.0000

kindlenook~l |   1.0000   1.0000   0.5221   0.1223   1.0000

kindlenook~s |   1.0000   1.0000   0.5229   0.5128   0.6842   1.0000

laptopcomp~l |   0.5338   0.0940   0.0223  -0.2301   0.0459  -0.0166   1.0000

laptopcomp~s |  -0.0605  -1.0000  -0.1448   0.0686  -0.0072  -0.0518   0.8019   1.0000

netbookper~l |   1.0000   1.0000  -0.0337  -0.0447   0.1527  -1.0000  -0.1981  -0.2309
1.0000

netbookfor~s |  -0.4897   1.0000  -1.0000  -0.0447   0.1527  -1.0000  -0.5456  -0.2309
0.9312   1.0000

digitalcam~l |   0.3112  -0.1105   0.4725   0.2803   0.4467   0.1909   0.1254   0.0000
1.0000   1.0000   1.0000

digitalcam~s |   0.2876   0.0055   0.1157   0.2080   0.1929   0.3733   0.0961   0.2888
0.1804   0.1804   0.7550

blurayдvdp~l |   1.0000   0.2521   0.2911   0.1995   0.4321   0.4232   0.4627   0.2126  -
0.1397  -0.1397   0.4543

blurayдvdf~s |   1.0000   1.0000  -0.3004  -0.3132   0.6165   0.6978   1.0000   1.0000
0.3725   0.3725   1.0000

digitalpro~l |   1.0000   1.0000   0.2677  -0.2297   0.4938   0.2650   0.1795  -0.2922
0.4257   0.4257   1.0000
```

```
digitalpro~s |   0.2820   1.0000   0.4706   0.6710   0.5416   0.1113   0.1305   0.1825
0.3872   0.0232   0.3797



             | digita.. bluray~l bluray~s digita.. digita..

-------------+-----------------------------------------------

digitalcam~s |   1.0000

bluraydvdp~l |   0.3406   1.0000

bluraydvdf~s |   0.6241   0.6691   1.0000

digitalpro~l |   0.3853   0.6109   0.6274   1.0000

digitalpro~s |   0.3539   0.5090   0.3422   0.6120   1.0000



. tetrachoric  smartphonecellphonepersonal  smartphonecellphoneforbusiness
tabletpersonal  tabletforbusiness  kin

> dlenookebookreaderpersonal  kindlenookebookreaderforbusiness  laptopcomputerpersonal
laptopcomputerforbusiness

>  netbookpersonal  netbookforbusiness  digitalcamerapersonal  digitalcameraforbusiness
bluraydvdpersonal blurayd

> vdforbusiness  digitalprojectorpersonal  digitalprojectorforbusiness, posdef

(obs=105)



matrix with tetrachoric correlations is not positive semidefinite;

  it has 5 negative eigenvalues

  maxdiff(corr,adj-corr) =  0.6315

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



    adj-corr | smartp~l smartp~s tablet~l tablet~s kindle~l kindle~s laptop~l laptop~s
netboo~l netboo~s digita..
```

```
-------------+------------------------------------------------------------------------------
------------------------

smartphone~l |   1.0000

smartphone~s |   0.3739   1.0000

tabletpers~l |   0.1911   0.0697   1.0000

tabletforb~s |  -0.0972   0.4792   0.5250   1.0000

kindlenook~l |   0.6484   0.6108   0.3435   0.1958   1.0000

kindlenook~s |   0.4931   0.3907   0.3923   0.3490   0.5654   1.0000

laptopcomp~l |   0.3857  -0.0429  -0.0038  -0.1862   0.0675   0.1464   1.0000

laptopcomp~s |   0.0004  -0.4161  -0.1002  -0.0841  -0.0624  -0.0518   0.6633   1.0000

netbookper~l |   0.3685   0.4129  -0.0832  -0.0014   0.2265  -0.4028  -0.0691  -0.2088
1.0000

netbookfor~s |  -0.1874   0.3952  -0.5172  -0.0345   0.0354  -0.4657  -0.2993  -0.1925
0.6102   1.0000

digitalcam~l |   0.3044   0.2086   0.2321   0.1049   0.3290  -0.0109   0.0640   0.1035
0.5431   0.4790   1.0000

digitalcam~s |   0.2469   0.0537   0.1174   0.1731   0.1713   0.2728   0.0730   0.2960
0.1288   0.1320   0.6376

bluraydvdp~l |   0.6554   0.1956   0.2339   0.1304   0.4146   0.4011   0.4136   0.2134
0.0074  -0.1610   0.3517

bluraydvdf~s |   0.6043   0.3897  -0.1655  -0.0700   0.5092   0.3575   0.6606   0.4870
0.2554   0.2189   0.5165

digitalpro~l |   0.6207   0.5500   0.1838  -0.0705   0.5253   0.2444   0.1764  -0.2724
0.4483   0.2944   0.6460

digitalpro~s |   0.2551   0.5976   0.4128   0.5802   0.4729   0.1567   0.1667   0.0642
0.2990   0.1112   0.2936



    adj-corr | digita.. bluray~l bluray~s digita.. digita..

-------------+---------------------------------------------
```

```
digitalcam~s |   1.0000
bluraydvdp~l |   0.3289   1.0000
bluraydvdf~s |   0.4764   0.5010   1.0000
digitalpro~l |   0.3588   0.5612   0.5252   1.0000
digitalpro~s |   0.3001   0.4351   0.2888   0.4748   1.0000

. display r(sum_w)
.


.
.  matrix a= r(corr)


.
. factormat a, n(105)
(obs=105)
(collinear variables specified)

Factor analysis/correlation                       Number of obs    =      105
    Method: principal factors                     Retained factors =       11
    Rotation: (unrotated)                         Number of params =      120

    Beware: solution is a Heywood case
            (i.e., invalid or boundary values of uniqueness)
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	5.17824	2.37136	0.3236	0.3236
Factor2	2.80688	0.31111	0.1754	0.4991
Factor3	2.49576	0.95647	0.1560	0.6551
Factor4	1.53929	0.38698	0.0962	0.7513
Factor5	1.15231	0.17024	0.0720	0.8233
Factor6	0.98208	0.36478	0.0614	0.8847
Factor7	0.61729	0.18321	0.0386	0.9232
Factor8	0.43408	0.01767	0.0271	0.9504
Factor9	0.41641	0.07213	0.0260	0.9764
Factor10	0.34428	0.31090	0.0215	0.9979
Factor11	0.03338	0.03338	0.0021	1.0000
Factor12	0.00000	0.00000	0.0000	1.0000
Factor13	0.00000	0.00000	0.0000	1.0000
Factor14	0.00000	0.00000	0.0000	1.0000
Factor15	0.00000	0.00000	0.0000	1.0000
Factor16	-0.00000	.	-0.0000	1.0000

LR test: independent vs. saturated: chi2(120) = 1.8e+04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8	Factor9
smartphone~l	0.7621	0.1989	0.1073	-0.4547	-0.1653	0.1347	0.1230	-0.3038	0.0872
smartphone~s	0.6521	-0.3674	-0.3988	-0.2051	0.4469	-0.1237	-0.0300	0.0582	0.1374
tabletpers~l	0.3234	0.3539	-0.6007	0.2937	-0.3504	0.3441	0.2051	0.1925	0.0221
tabletforb~s	0.2828	0.0376	-0.6699	0.5355	0.3050	-0.0528	0.0006	-0.1386	0.1173
kindlenook~l	0.7598	0.0460	-0.2433	-0.2616	0.0701	-0.0880	0.3348	0.0457	-0.3965
kindlenook~s	0.4986	0.5571	-0.3940	-0.2192	-0.0096	-0.4671	0.0451	0.0339	0.1084
laptopcomp~l	0.3415	0.5374	0.5557	-0.0299	0.3074	0.2937	-0.0090	0.1992	0.2372
laptopcomp~s	0.0652	0.5158	0.6310	0.4489	0.2490	0.0280	0.1719	-0.0454	-0.1745
netbookper~l	0.4134	-0.7196	0.1689	-0.0124	-0.0251	0.3552	0.2687	-0.2441	0.1546
netbookfor~s	0.1476	-0.8873	0.2536	0.1102	0.1860	-0.1965	-0.0717	0.0741	-0.1304
digitalcam~l	0.6526	-0.3521	0.2542	0.3744	-0.3981	-0.0406	0.1060	0.1735	-0.0161
digitalcam~s	0.5234	0.0287	0.2227	0.5116	-0.3309	-0.4286	-0.0449	-0.1637	0.1378

```
    bluraydvdp~l |   0.6967    0.3475    0.1074   -0.0382   -0.1191    0.1391   -0.4571
-0.2084   -0.2075

    bluraydvdf~s |   0.7547    0.1192    0.5331   -0.0479    0.2437   -0.2118    0.1097
0.0793    0.0582

    digitalpro~l |   0.8079   -0.2634    0.0532   -0.2211   -0.2576    0.0919   -0.2646
0.2559    0.0542

    digitalpro~s |   0.6638   -0.0649   -0.2975    0.3630    0.3238    0.3028   -0.1842
-0.0077   -0.1027

    ------------------------------------------------------------------------------
-------------------
```

```
    ------------------------------------------------

        Variable | Factor10  Factor11 |   Uniqueness

    -------------+--------------------+--------------

    smartphone~l |   0.0005   -0.0300 |      0.0000

    smartphone~s |   0.0024    0.0205 |      0.0000

    tabletpers~l |   0.0416    0.0220 |     -0.0000

    tabletforb~s |   0.2329   -0.0070 |      0.0000

    kindlenook~l |  -0.0715    0.0624 |      0.0000

    kindlenook~s |   0.0445   -0.0499 |     -0.0000

    laptopcomp~l |   0.0324    0.0844 |      0.0000

    laptopcomp~s |  -0.0022   -0.0724 |     -0.0000

    netbookper~l |   0.0117   -0.0057 |     -0.0000

    netbookfor~s |   0.1146    0.0221 |     -0.0000

    digitalcam~l |   0.2079   -0.0224 |      0.0000

    digitalcam~s |  -0.2610    0.0690 |     -0.0000

    bluraydvdp~l |   0.2248    0.0379 |     -0.0000
```

```
    bluraydvdf~s |   0.0571   -0.0233 |      0.0000
    digitalpro~l |  -0.0975   -0.0593 |      0.0000
    digitalpro~s |  -0.3037   -0.0385 |      0.0000
    -------------------------------------------------

. rotate

Factor analysis/correlation                       Number of obs    =      105
    Method: principal factors                     Retained factors =       11
    Rotation: orthogonal varimax (Kaiser off)     Number of params =      120

    Beware: solution is a Heywood case
            (i.e., invalid or boundary values of uniqueness)

    ------------------------------------------------------------------------
         Factor  |     Variance   Difference        Proportion   Cumulative
    -------------+----------------------------------------------------------
        Factor1  |      2.32167      0.23727            0.1451       0.1451
        Factor2  |      2.08441      0.41124            0.1303       0.2754
        Factor3  |      1.67317      0.06256            0.1046       0.3800
        Factor4  |      1.61060      0.08795            0.1007       0.4806
        Factor5  |      1.52265      0.00542            0.0952       0.5758
        Factor6  |      1.51724      0.10505            0.0948       0.6706
```

```
    Factor7  |      1.41219      0.01745           0.0883       0.7589
    Factor8  |      1.39473      0.11137           0.0872       0.8460
    Factor9  |      1.28336      0.19236           0.0802       0.9263
   Factor10  |      1.09100      1.00202           0.0682       0.9944
   Factor11  |      0.08898            .           0.0056       1.0000
-------------------------------------------------------------------------
LR test: independent vs. saturated: chi2(120) = 1.8e+04 Prob>chi2 = 0.0000


Rotated factor loadings (pattern matrix) and unique variances

-------------------------------------------------------------------------------------------
-------------------
    Variable |  Factor1   Factor2   Factor3   Factor4   Factor5   Factor6   Factor7
Factor8   Factor9
-------------+-----------------------------------------------------------------------------
-------------------
 smartphone~l |   0.5856    0.2791    0.1750    0.3530    0.5433   -0.1351    0.1587
-0.1055    0.2124
 smartphone~s |   0.5221    0.0282   -0.2358    0.1970    0.0267    0.4803   -0.0494
0.0752    0.5477
 tabletpers~l |   0.1533   -0.0790    0.9109   -0.0414    0.0699    0.2797    0.0317
0.1569    0.0341
 tabletforb~s |   0.0615   -0.1262    0.2211   -0.0319    0.0108    0.9376    0.0845
0.0150   -0.0034
 kindlenook~l |   0.9315    0.0157    0.1192    0.0805    0.1639    0.0695    0.0199
0.1617    0.0411
 kindlenook~s |   0.6131    0.1231    0.2562   -0.4634    0.2011    0.2877    0.2451
-0.1477    0.2611
```

```
    laptopcomp~l |   0.0146    0.9663    0.0912   -0.0275    0.1916   -0.1052   -0.0295
-0.0448   -0.0408

    laptopcomp~s |  -0.0560    0.6520   -0.0386   -0.1236    0.0327   -0.0293    0.2033
0.0273   -0.7108

    netbookper~l |   0.1017   -0.0212   -0.1450    0.9331    0.0114    0.0207    0.0513
0.2422    0.1469

    netbookfor~s |  -0.0166   -0.1773   -0.7000    0.3722   -0.1427    0.0775    0.0435
0.5206    0.1121

    digitalcam~l |   0.1249    0.0891    0.0703    0.3399    0.1678    0.0502    0.4383
0.7947    0.0276

    digitalcam~s |   0.0752    0.0881    0.0059    0.0182    0.1287    0.0792    0.9520
0.2134   -0.0531

    bluraydvdp~l |   0.2055    0.2421    0.0901   -0.0703    0.9047    0.0732    0.1349
0.1289    0.0088

    bluraydvdf~s |   0.4702    0.6887   -0.2759    0.0987    0.2099    0.0156    0.3086
0.2636    0.0224

    digitalpro~l |   0.3107    0.1160    0.0337    0.1961    0.3907   -0.1781    0.1984
0.4526    0.5620

    digitalpro~s |   0.2001    0.1238    0.1313    0.1700    0.1905    0.3987    0.1339
0.0680    0.0781

    ------------------------------------------------------------------------------------
-------------------
```

```
    ------------------------------------------------
        Variable | Factor10  Factor11 |   Uniqueness
    -------------+--------------------+--------------
    smartphone~l |  -0.0712    0.1548 |      0.0000
    smartphone~s |   0.3038    0.0220 |      0.0000
    tabletpers~l |   0.1663   -0.0350 |     -0.0000
    tabletforb~s |   0.2093   -0.0047 |      0.0000
    kindlenook~l |   0.2177   -0.0630 |      0.0000
```

```
    kindlenook~s |  -0.1591    0.1730 |     -0.0000
    laptopcomp~l |   0.0636   -0.0259 |      0.0000
    laptopcomp~s |   0.0646    0.0394 |     -0.0000
    netbookper~l |   0.1176    0.0135 |     -0.0000
    netbookfor~s |   0.1345   -0.0987 |     -0.0000
    digitalcam~l |   0.0288    0.0010 |      0.0000
    digitalcam~s |   0.0930    0.0057 |     -0.0000
    blurayдvdp~l |   0.1642   -0.0202 |     -0.0000
    blurayдvdf~s |   0.0273    0.0918 |      0.0000
    digitalpro~l |   0.3125    0.0909 |      0.0000
    digitalpro~s |   0.8212   -0.0094 |      0.0000
    -----------------------------------------------


Factor rotation matrix


    ------------------------------------------------------------------------------
-------------------
                 | Factor1  Factor2  Factor3  Factor4  Factor5  Factor6  Factor7  Factor8
Factor9  Fact~10
    -------------+----------------------------------------------------------------
-------------------
         Factor1 |  0.5621   0.2992   0.0847   0.2233   0.4134   0.1935   0.3189   0.3024
0.2369   0.2776
         Factor2 |  0.0987   0.4306   0.4672  -0.5512   0.2316  -0.0100   0.0395  -0.3686
-0.2679  -0.1272
         Factor3 | -0.1934   0.5622  -0.4181   0.1693   0.0868  -0.5079   0.1861   0.1788
-0.2925  -0.1589
```

```
         Factor4 | -0.4180   0.0295   0.1633  -0.0142  -0.1645   0.4574   0.4326   0.2979
-0.4484   0.2788

         Factor5 |  0.1269   0.4054  -0.4881  -0.0462  -0.2206   0.4558  -0.3682  -0.2912
-0.0727   0.3105

         Factor6 | -0.2867   0.1819   0.4526   0.4929   0.1907  -0.1383  -0.4981  -0.0445
-0.0622   0.3497

         Factor7 |  0.4771   0.0895   0.2809   0.3774  -0.5760   0.0044  -0.0165   0.0154
-0.3362  -0.3120

         Factor8 | -0.0046   0.2600   0.1696  -0.4241  -0.4128  -0.1842  -0.2431   0.5725
0.3186   0.1595

         Factor9 | -0.3578   0.3558   0.1438   0.2217  -0.2115   0.2220   0.2574  -0.2326
0.5829  -0.2952

        Factor10 | -0.0841   0.0623  -0.0368   0.0087   0.3297   0.4303  -0.3917   0.4115
-0.0876  -0.6022

        Factor11 |  0.0314   0.0686   0.0174   0.0280   0.0138   0.0088   0.1102  -0.1174
0.1199  -0.1117

    ------------------------------------------------------------------------------
-------------------



    ----------------------

                 | Fact~11

    -------------+--------

         Factor1 |  0.0519

         Factor2 |  0.0600

         Factor3 |  0.0091

         Factor4 | -0.0815

         Factor5 | -0.0276

         Factor6 | -0.0718

         Factor7 |  0.0202
```

```
         Factor8 | -0.0745
         Factor9 |  0.1851
        Factor10 | -0.0259
        Factor11 | -0.9696
    ------------------------
```

```
. *The data are on a likert scale, therefore we use polychoric correlations.*

. polychoric marketingtocustomersbeyondwomise membercustomerengagementisessent
onlyadoptuserfriendlytech newformso

> ftechmakeuscompetitive mustdevelopbetterlinesofcommunic
canfullyengagecustomerthroughwom useofsocialmediaiseffec

> tivecommu



Polychoric correlation matrix



                                  marketingtocustomersbeyondwomise
membercustomerengagementisessent

marketingtocustomersbeyondwomise                                 1

membercustomerengagementisessent                          .5352308
1

       onlyadoptuserfriendlytech                          .11885652
.18519717

 newformsoftechmakeuscompetitive                          .60713781
.49211071

mustdevelopbetterlinesofcommunic                           .6071387
.49184438

canfullyengagecustomerthroughwom                         -.33223265
-.12733445
```

```
useofsocialmediaiseffectivecommu                          .48656532
.50507274



                                    onlyadoptuserfriendlytech
newformsoftechmakeuscompetitive

       onlyadoptuserfriendlytech                                  1

 newformsoftechmakeuscompetitive                          .28825668
1

mustdevelopbetterlinesofcommunic                          .14002697
.7487738

canfullyengagecustomerthroughwom                          .20046978
-.36593715

useofsocialmediaiseffectivecommu                          .13812638
.68052002



                                 mustdevelopbetterlinesofcommunic
canfullyengagecustomerthroughwom

mustdevelopbetterlinesofcommunic                                  1

canfullyengagecustomerthroughwom                         -.36136191
1

useofsocialmediaiseffectivecommu                          .63082309
-.2301478



                                 useofsocialmediaiseffectivecommu

useofsocialmediaiseffectivecommu                                  1



. display r(sum_w)

105
```

```
. matrix v= r(R)


. factormat v,n(105)

(obs=105)


Factor analysis/correlation                       Number of obs    =      105
    Method: principal factors                     Retained factors =        4
    Rotation: (unrotated)                         Number of params =       21

    ------------------------------------------------------------------------------
         Factor  |   Eigenvalue   Difference        Proportion   Cumulative
    -------------+----------------------------------------------------------------
        Factor1  |      3.08116      2.61292            0.9632       0.9632
        Factor2  |      0.46824      0.36439            0.1464       1.1096
        Factor3  |      0.10385      0.07740            0.0325       1.1420
        Factor4  |      0.02645      0.11215            0.0083       1.1503
        Factor5  |     -0.08570      0.08489           -0.0268       1.1235
        Factor6  |     -0.17060      0.05387           -0.0533       1.0702
        Factor7  |     -0.22447            .           -0.0702       1.0000
    ------------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(21) =  300.96 Prob>chi2 = 0.0000


Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Factor3	Factor4	Uniqueness
marketingt~e	0.7218	-0.0646	0.1463	-0.0768	0.4476
membercust~t	0.6237	0.1528	0.2066	0.0120	0.5448
onlyadoptu~h	0.2064	0.4727	-0.0825	-0.0580	0.7237
newformsof~e	0.8675	0.0534	-0.1652	-0.0254	0.2167
mustdevelo~c	0.8265	-0.0730	-0.0547	0.0047	0.3085
canfullyen~m	-0.3783	0.4541	0.0495	0.0348	0.6470
useofsocia~u	0.7415	0.0533	-0.0137	0.1231	0.4320

. rotate

Factor analysis/correlation — Number of obs = 105
Method: principal factors — Retained factors = 4
Rotation: orthogonal varimax (Kaiser off) — Number of params = 21

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.97635	2.50770	0.9304	0.9304

```
    Factor2  |      0.46865      0.26283            0.1465       1.0769
    Factor3  |      0.20582      0.17695            0.0643       1.1413
    Factor4  |      0.02887            .            0.0090       1.1503
-------------------------------------------------------------------------
LR test: independent vs. saturated:  chi2(21) =  300.96 Prob>chi2 = 0.0000
```

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Factor4	Uniqueness
marketingt~e	0.6785	-0.1011	0.2796	-0.0602	0.4476
membercust~t	0.5781	0.1104	0.3265	0.0463	0.5448
onlyadoptu~h	0.2269	0.4718	0.0065	-0.0467	0.7237
newformsof~e	0.8831	0.0358	0.0075	-0.0465	0.2167
mustdevelo~c	0.8205	-0.0990	0.0921	-0.0075	0.3085
canfullyen~m	-0.3699	0.4605	0.0126	0.0632	0.6470
useofsocia~u	0.7352	0.0220	0.1108	0.1213	0.4320

Factor rotation matrix

```
             | Factor1  Factor2  Factor3  Factor4
-------------+------------------------------------
     Factor1 |  0.9822  -0.0374   0.1840  -0.0015
     Factor2 |  0.0219   0.9950   0.0858   0.0471
     Factor3 | -0.1846  -0.0860   0.9695   0.1363
     Factor4 |  0.0259  -0.0356  -0.1373   0.9895
-------------------------------------------------
```

```
. predict AttToValueofCommTech
(regression scoring assumed)
```

Scoring coefficients (method = regression; based on varimax rotated factors)

```
-----------------------------------------------------
    Variable |  Factor1   Factor2   Factor3   Factor4
-------------+---------------------------------------
marketingt~e |  0.11269  -0.11042   0.32123  -0.10232
membercust~t |  0.07920   0.12874   0.31256   0.06007
onlyadoptu~h |  0.01271   0.35114  -0.00019  -0.04320
newformsof~e |  0.46613   0.17517  -0.35733  -0.17513
mustdevelo~c |  0.25546  -0.15524  -0.01022   0.00774
canfullyen~m | -0.02653   0.38462   0.03729   0.04673
useofsocia~u |  0.15414   0.02948   0.05484   0.27179
```

```
    ----------------------------------------------------

(variable means assumed 0; use means() option of factormat for nonzero means)
(variable std. deviations assumed 1; use sds() option of factormat to change)

. sum  furthestmembermiles

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
furthestme~s |       103    148.0485    261.5424         15       2000

.  gen  stdfurmiles = (furthestmembermiles-(148.0485))/261.5424
(2 missing values generated)

. sum  estimatedgrossrevenue

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
estimatedg~e |        94    6.65e+07    2.25e+08         70   1.50e+09

.  gen stestgr = (estimatedgrossrevenue-(6.65e+07))/2.25e+08
(11 missing values generated)
```

```
. sum ofstockholders

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
ofstockhol~s |        98    3517.888    6959.008         20      35000

. gen stofsh =( ofstockholders-(3517.888))/(6959.008)
(7 missing values generated)

. sum offulltimeemployees

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
offulltime~s |       103    103.3689    591.6856          2       6000

. gen stoffultimeemp =(  offulltimeemployees-(103.3689 ))/(591.6856)
(2 missing values generated)

. sum ofseasonalemployees

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
ofseasonal~s |       101    20.92079    32.61309          0        250
```

```
. gen    stofseas        =(      ofseasonalemployees-(   20.92079))/32.61309
(4 missing values generated)

. factor  stdfurmiles stestgr stofsh stoffultimeemp stofseas
(obs=84)

Factor analysis/correlation                       Number of obs    =         84
    Method: principal factors                     Retained factors =          2
    Rotation: (unrotated)                         Number of params =          9

    --------------------------------------------------------------------------
         Factor  |   Eigenvalue   Difference        Proportion   Cumulative
    -------------+------------------------------------------------------------
        Factor1  |      1.65956      1.40584            1.1306       1.1306
        Factor2  |      0.25373      0.30393            0.1728       1.3034
        Factor3  |     -0.05021      0.09938           -0.0342       1.2692
        Factor4  |     -0.14959      0.09599           -0.1019       1.1673
        Factor5  |     -0.24558            .           -0.1673       1.0000
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(10) =   84.62 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

```
    ------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness
    -------------+--------------------+--------------
     stdfurmiles |   0.4379   -0.3489 |      0.6865
         stestgr |   0.7718    0.0281 |      0.4035
          stofsh |   0.4395    0.0026 |      0.8068
    stoffultim~p |   0.6995   -0.0384 |      0.5093
        stofseas |   0.4355    0.3602 |      0.6806
    ------------------------------------------------
```

```
. rotate
```

```
Factor analysis/correlation                         Number of obs    =        84
    Method: principal factors                       Retained factors =         2
    Rotation: orthogonal varimax (Kaiser off)       Number of params =         9

    ------------------------------------------------------------------------------
         Factor  |     Variance   Difference        Proportion   Cumulative
    -------------+----------------------------------------------------------------
        Factor1  |      1.65843      1.40357            1.1298       1.1298
        Factor2  |      0.25486            .            0.1736       1.3034
    ------------------------------------------------------------------------------
```

```
    LR test: independent vs. saturated:  chi2(10) =   84.62 Prob>chi2 = 0.0000


Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness
    -------------+--------------------+--------------
     stdfurmiles |   0.4477   -0.3363 |      0.6865
         stestgr |   0.7707    0.0500 |      0.4035
          stofsh |   0.4393    0.0151 |      0.8068
    stoffultim~p |   0.7003   -0.0185 |      0.5093
        stofseas |   0.4251    0.3724 |      0.6806
    -------------------------------------------------


Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2
    -------------+------------------
         Factor1 |  0.9996   0.0284
         Factor2 | -0.0284   0.9996
    --------------------------------
```

```
. predict CooperativeCharacteristics

(regression scoring assumed)


Scoring coefficients (method = regression; based on varimax rotated factors)


    ---------------------------------
        Variable |  Factor1   Factor2
    -------------+-------------------
     stdfurmiles |  0.14464  -0.33561
         stestgr |  0.43225   0.05606
          stofsh |  0.13937   0.00566
    stoffultim~p |  0.31022  -0.04430
        stofseas |  0.12257   0.35422
    ---------------------------------




. tetrachoric internetadvertising internetmarketingpromotion annualmeeting
newsletterpublications printadvertising

>  televisionadvertisingmedia educationalpodcasts fielddayscooperativesponsoredsho
facebook twitter linkedin email

>  textmessaging websitemaintained

(obs=103)


matrix with tetrachoric correlations is not positive semidefinite;
```

```
  it has 3 negative eigenvalues

  maxdiff(corr,adj-corr) =  0.7007

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



             | intern~g intern~n annual~g newsle~s printa~g televi~a educat~s fieldd~o
facebook  twitter linkedin

-------------+------------------------------------------------------------------------
-------------------------

internetad~g |   1.0000

internetma~n |   0.7564   1.0000

annualmeet~g |  -0.3170  -0.2711   1.0000

newsletter~s |   0.5257   0.3434   0.2770   1.0000

printadver~g |   0.3295  -0.1619   0.3590   0.4321   1.0000

television~a |   0.5628   0.2522   0.0277   0.4500   0.5477   1.0000

educationa~s |   0.0039   0.4756   1.0000   1.0000   0.1181  -1.0000   1.0000

fielddaysc~o |  -0.0846   0.0235   0.3723   0.2295   0.2862   0.2840  -0.0642   1.0000

    facebook |   0.4107   0.3814   0.1686   0.6102   0.2840   0.3790  -1.0000   0.1370
1.0000

     twitter |   0.2487   0.2552   1.0000   1.0000   0.5394   0.0993  -1.0000   0.2984
0.7564   1.0000

    linkedin |   0.0039   0.4756   1.0000   0.0307   0.1181  -1.0000   0.6890   0.3056
0.1323  -1.0000   1.0000

       email |   0.2770   0.4531  -0.2785   0.1806   0.0014  -0.0034   1.0000   0.2486
0.3294   0.3959   1.0000

textmessag~g |  -0.1463   0.0083  -0.3123  -0.0910  -0.0983  -0.0626   0.2119   0.2496  -
0.1132  -0.1081   1.0000

websitemai~d |   0.8098   1.0000  -0.3151   0.4298   0.3093   0.4235   1.0000  -0.0967
0.4796   0.4318   1.0000
```

```
             |    email textme~g webs~ned

-------------+---------------------------

       email |   1.0000

textmessag~g |   0.7856   1.0000

websitemai~d |   0.0837  -0.2208   1.0000



.  tetrachoric  internetadvertising  internetmarketingpromotion annualmeeting
newsletterpublications printadvertis

> ing televisionadvertisingmedia educationalpodcasts fielddayscooperativesponsoredsho
facebook twitter linkedin  e

> mail textmessaging  websitemain,posdef

(obs=103)



matrix with tetrachoric correlations is not positive semidefinite;

  it has 3 negative eigenvalues

  maxdiff(corr,adj-corr) =  0.7007

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



    adj-corr | intern~g intern~n annual~g newsle~s printa~g televi~a educat~s fieldd~o
facebook  twitter linkedin

-------------+-----------------------------------------------------------------------
------------------------

internetad~g |   1.0000

internetma~n |   0.7094   1.0000

annualmeet~g |  -0.2696  -0.1636   1.0000
```

```
newsletter~s |   0.4393   0.3454   0.3409   1.0000

printadver~g |   0.3157  -0.1067   0.3481   0.4133   1.0000

television~a |   0.5144   0.1648  -0.2064   0.2594   0.4427   1.0000

educationa~s |   0.0397   0.2770   0.3537   0.3976   0.0386  -0.4615   1.0000

fielddaysc~o |  -0.0761   0.0146   0.3295   0.1820   0.2786   0.2446  -0.0294   1.0000

    facebook |   0.4017   0.3214   0.0744   0.3328   0.2506   0.3567  -0.4595   0.1527
1.0000

     twitter |   0.2128   0.1235   0.3729   0.5746   0.3694   0.3178  -0.2993   0.2286
0.6335   1.0000

    linkedin |  -0.0133   0.3057   0.3469  -0.0176   0.0372  -0.4708   0.5726   0.1950
0.0408  -0.3210   1.0000

       email |   0.2372   0.4224  -0.0140   0.2992   0.0261  -0.1552   0.4174   0.2245
0.1596   0.0790   0.5507

textmessag~g |  -0.1224   0.0284  -0.1282  -0.1076  -0.0679  -0.1451   0.1383   0.2614  -
0.0239  -0.2013   0.5463

websitemai~d |   0.7064   0.8377   0.0152   0.4450   0.2811   0.1530   0.4143  -0.0639
0.3190   0.0573   0.4278



    adj-corr |    email textme~g webs~ned

-------------+---------------------------

       email |   1.0000

textmessag~g |   0.7125   1.0000

websitemai~d |   0.2487  -0.0905   1.0000



.  display r(sum_w)

.
```

```
.

.  matrix c= r(corr)



.

. factormat c, n(105)

(obs=105)

(collinear variables specified)



Factor analysis/correlation                       Number of obs    =      105

    Method: principal factors                     Retained factors =       11

    Rotation: (unrotated)                         Number of params =       91


    Beware: solution is a Heywood case

            (i.e., invalid or boundary values of uniqueness)


    ------------------------------------------------------------------------------

         Factor  |   Eigenvalue   Difference        Proportion   Cumulative

    -------------+----------------------------------------------------------------

        Factor1  |      3.80083      0.69364            0.2715       0.2715

        Factor2  |      3.10719      0.98987            0.2219       0.4934

        Factor3  |      2.11732      0.46765            0.1512       0.6447

        Factor4  |      1.64967      0.60362            0.1178       0.7625

        Factor5  |      1.04605      0.20018            0.0747       0.8372
```

```
    Factor6  |      0.84586      0.16614            0.0604       0.8976
    Factor7  |      0.67973      0.43272            0.0486       0.9462
    Factor8  |      0.24701      0.01837            0.0176       0.9638
    Factor9  |      0.22864      0.05923            0.0163       0.9802
   Factor10  |      0.16940      0.06111            0.0121       0.9923
   Factor11  |      0.10830      0.10830            0.0077       1.0000
   Factor12  |      0.00000      0.00000            0.0000       1.0000
   Factor13  |      0.00000      0.00000            0.0000       1.0000
   Factor14  |     -0.00000            .           -0.0000       1.0000
-------------------------------------------------------------------------
LR test: independent vs. saturated:  chi2(91) =       . Prob>chi2 =      .


Factor loadings (pattern matrix) and unique variances

-------------------------------------------------------------------------------------------
-------------------
    Variable |  Factor1   Factor2   Factor3   Factor4   Factor5   Factor6   Factor7
Factor8   Factor9
-------------+-----------------------------------------------------------------------------
-------------------
internetad~g |   0.7724   -0.1845   -0.4839   -0.0181    0.1629   -0.0182   -0.0655
-0.1256    0.0246
internetma~n |   0.7403    0.2161   -0.4984   -0.0099   -0.1694    0.0595    0.3073
-0.0764    0.1203
annualmeet~g |   0.1819    0.1368    0.8071   -0.3946   -0.1482    0.1970    0.0507
0.0324    0.2560
newsletter~s |   0.7424   -0.0865    0.2719   -0.2798   -0.0301   -0.4525    0.0210
0.2435   -0.1450
```

```
    printadver~g |   0.4879   -0.2680    0.4375   -0.1057    0.5043    0.1496   -0.4169
-0.1553   -0.0726

    television~a |   0.3968   -0.6770   -0.1091    0.2451    0.4517   -0.0143    0.0966
0.1940    0.2220

    educationa~s |   0.2516    0.7631    0.0916   -0.5077    0.1664   -0.2349    0.0443
0.0306   -0.0174

    fielddaysc~o |   0.2508    0.0179    0.5782    0.3919    0.2813    0.1334    0.5629
-0.0783   -0.1674

        facebook |   0.5902   -0.3963    0.0780    0.3413   -0.4597    0.2872   -0.1553
0.1505   -0.1429

         twitter |   0.4982   -0.5348    0.4342    0.0480   -0.4118   -0.2105   -0.0192
-0.1758    0.0943

        linkedin |   0.2822    0.8362    0.1532    0.0864   -0.0404    0.4157   -0.0935
0.0660    0.0044

           email |   0.4828    0.5997    0.0608    0.4583   -0.0804   -0.3362   -0.1055
-0.1496    0.0172

    textmessag~g |   0.0515    0.5833    0.1185    0.7199    0.1104   -0.1321   -0.1780
0.1227    0.1136

    websitemai~d |   0.7990    0.2123   -0.3571   -0.2798    0.0403    0.2698   -0.0016
0.0296   -0.0393

    ------------------------------------------------------------------------------
-------------------
```

```
    -------------------------------------------------

        Variable | Factor10  Factor11 |   Uniqueness

    -------------+--------------------+--------------

    internetad~g |   0.2453    0.1649 |     -0.0000

    internetma~n |  -0.0957   -0.0248 |     -0.0000

    annualmeet~g |   0.1049    0.0101 |     -0.0000

    newsletter~s |   0.0007    0.0517 |     -0.0000
```

```
    printadver~g |  -0.0815   -0.0315 |     -0.0000
    television~a |   0.0151   -0.1071 |      0.0000
    educationa~s |   0.0176   -0.0435 |     -0.0000
    fielddaysc~o |   0.0131    0.0296 |     -0.0000
        facebook |   0.0812   -0.0664 |     -0.0000
         twitter |  -0.1310    0.0605 |     -0.0000
        linkedin |   0.0466    0.0214 |     -0.0000
           email |   0.0930   -0.1778 |     -0.0000
    textmessag~g |  -0.1153    0.1493 |     -0.0000
    websitemai~d |  -0.1840   -0.0084 |     -0.0000
    -------------------------------------------------

. rotate

Factor analysis/correlation                       Number of obs    =      105
    Method: principal factors                     Retained factors =       11
    Rotation: orthogonal varimax (Kaiser off)     Number of params =       91

    Beware: solution is a Heywood case
            (i.e., invalid or boundary values of uniqueness)

    ------------------------------------------------------------------------
         Factor  |     Variance   Difference        Proportion   Cumulative
```

```
    -------------+------------------------------------------------------------

        Factor1  |      2.79077      0.70778            0.1993       0.1993

        Factor2  |      2.08298      0.56472            0.1488       0.3481

        Factor3  |      1.51826      0.17578            0.1084       0.4566

        Factor4  |      1.34248      0.01227            0.0959       0.5525

        Factor5  |      1.33021      0.07080            0.0950       0.6475

        Factor6  |      1.25941      0.06215            0.0900       0.7374

        Factor7  |      1.19725      0.14934            0.0855       0.8230

        Factor8  |      1.04791      0.06015            0.0749       0.8978

        Factor9  |      0.98776      0.72984            0.0706       0.9684

       Factor10  |      0.25792      0.07287            0.0184       0.9868

       Factor11  |      0.18505            .            0.0132       1.0000

    ------------------------------------------------------------------------------

    LR test: independent vs. saturated:  chi2(91) =       . Prob>chi2 =      .


Rotated factor loadings (pattern matrix) and unique variances


    ------------------------------------------------------------------------------------------
-------------------

        Variable |  Factor1   Factor2   Factor3   Factor4   Factor5   Factor6   Factor7
Factor8   Factor9

    -------------+----------------------------------------------------------------------------
-------------------

    internetad~g |   0.7225    0.0015    0.1542   -0.2117    0.2938    0.1787    0.2162
-0.0879    0.0531

    internetma~n |   0.9491    0.1410    0.0697   -0.0512    0.0545    0.0880   -0.2079
0.0439    0.0967
```

```
    annualmeet~g |  -0.1024   -0.0695    0.0130    0.9193   -0.1610    0.1811    0.1770
0.1805    0.1243

    newsletter~s |   0.2869    0.0261    0.0929    0.1678    0.0989    0.8809    0.1861
0.0720    0.2295

    printadver~g |   0.0565   -0.0116    0.0869    0.1728    0.1951    0.1568    0.9351
0.1191    0.0823

    television~a |   0.1501   -0.1300    0.1963   -0.1672    0.8903    0.0715    0.2483
0.1596    0.0829

    educationa~s |   0.3271    0.2207   -0.5816    0.3268   -0.3665    0.4324    0.0497
-0.0480   -0.2340

    fielddaysc~o |  -0.0435    0.1785    0.0639    0.1612    0.1153    0.0524    0.1093
0.9517    0.0477

        facebook |   0.2482    0.0529    0.9336    0.0480    0.1093    0.1085    0.0954
0.0532    0.1573

         twitter |   0.0331   -0.0778    0.4622    0.2044    0.1181    0.2992    0.1547
0.1035    0.7739

        linkedin |   0.3530    0.5549    0.0168    0.4222   -0.4237   -0.0985    0.0752
0.1130   -0.4216

           email |   0.2602    0.8505    0.0143   -0.0145   -0.1397    0.2063   -0.0043
0.0906    0.0945

    textmessag~g |  -0.0922    0.9590   -0.0217   -0.0695   -0.0130   -0.0752   -0.0291
0.1182   -0.1034

    websitemai~d |   0.9365    0.0041    0.0784    0.0609   -0.0420    0.1795    0.2264
-0.0660   -0.1257

    ------------------------------------------------------------------------------
-------------------
```

```
    ------------------------------------------------

        Variable | Factor10  Factor11 |   Uniqueness

    -------------+--------------------+--------------

    internetad~g |   0.4823    0.0338 |     -0.0000
```

```
    internetma~n |   0.0231    0.0782 |     -0.0000
    annualmeet~g |  -0.0352    0.0016 |     -0.0000
    newsletter~s |   0.0419    0.0133 |     -0.0000
    printadver~g |   0.0344    0.0005 |     -0.0000
    television~a |   0.0466   -0.0120 |      0.0000
    educationa~s |  -0.0305    0.1322 |     -0.0000
    fielddaysc~o |  -0.0137    0.0045 |     -0.0000
        facebook |   0.0243    0.0258 |     -0.0000
         twitter |   0.0143    0.0135 |     -0.0000
        linkedin |  -0.0478   -0.0352 |     -0.0000
           email |   0.0806    0.3504 |     -0.0000
    textmessag~g |  -0.0477   -0.1811 |     -0.0000
    websitemai~d |  -0.0739   -0.0480 |     -0.0000
    -------------------------------------------------


Factor rotation matrix


    ------------------------------------------------------------------------------------
-------------------
                 | Factor1  Factor2  Factor3  Factor4  Factor5  Factor6  Factor7  Factor8
Factor9  Fact~10
    -------------+----------------------------------------------------------------------
-------------------
         Factor1 |  0.7223   0.2020   0.2859   0.1364   0.1575   0.4056   0.2920   0.1344
0.1660   0.1115
         Factor2 |  0.2077   0.5910  -0.3891   0.2082  -0.5042   0.0024  -0.1560   0.0039
-0.3562  -0.0673
```

```
         Factor3 | -0.4987   0.1094   0.0818   0.5946  -0.1186   0.2120   0.3041   0.4137
0.2097  -0.1116

         Factor4 | -0.1861   0.6590   0.3855  -0.3506   0.2446  -0.2952  -0.1114   0.3102
0.0560   0.0238

         Factor5 | -0.0319   0.0298  -0.5336  -0.1750   0.4377  -0.0267   0.5326   0.2607
-0.3610   0.0748

         Factor6 |  0.2429  -0.2298   0.3715   0.3023  -0.1098  -0.6111   0.1964   0.1626
-0.4104  -0.0946

         Factor7 |  0.2080  -0.2594  -0.2153   0.0415   0.1210   0.0164  -0.5692   0.7031
0.0534  -0.0644

         Factor8 | -0.1240   0.0460   0.2349   0.1369   0.3470   0.4547  -0.2771  -0.1465
-0.5363  -0.2897

         Factor9 |  0.0935   0.1952  -0.2464   0.5296   0.5260  -0.3409  -0.1935  -0.3174
0.2778   0.0297

        Factor10 | -0.1559  -0.0415   0.1449   0.1949   0.0737   0.0680  -0.1550   0.0031
-0.3330   0.7916

        Factor11 |  0.0117   0.0277  -0.0741  -0.0255  -0.1619   0.0384  -0.0331   0.0607
0.1454   0.4898

    ------------------------------------------------------------------------------------
-------------------



    ------------------------

                 | Fact~11

    -------------+----------

         Factor1 |  0.0678

         Factor2 |  0.0535

         Factor3 | -0.0070

         Factor4 | -0.0146

         Factor5 | -0.0539
```

```
         Factor6 | -0.1759
         Factor7 |  0.0346
         Factor8 | -0.3340
         Factor9 | -0.0537
        Factor10 |  0.3786
        Factor11 | -0.8364
    ------------------------



.  * leads to a haywood case

.  tetrachoric  internetadvertising  internetmarketingpromotion annualmeeting
newsletterpublications printadvertis

> ing televisionadvertisingmedia  fielddayscooperativesponsoredsho facebook   email
textmessaging

(obs=105)



             | intern~g intern~n annual~g newsle~s printa~g televi~a fieldd~o facebook
email textme~g

-------------+------------------------------------------------------------------------
---------------

internetad~g |   1.0000

internetma~n |   0.7609   1.0000

annualmeet~g |  -0.3245  -0.2778   1.0000

newsletter~s |   0.5094   0.3288   0.2851   1.0000

printadver~g |   0.3286  -0.1581   0.3561   0.4244   1.0000

television~a |   0.5238   0.2265   0.0413   0.4625   0.5697   1.0000

fielddaysc~o |  -0.0665   0.0383   0.3624   0.2097   0.2854   0.2478   1.0000
```

```
    facebook |   0.3891   0.3642   0.1758   0.6140   0.3119   0.4266   0.1176   1.0000

       email |   0.2610   0.4404  -0.2697   0.1950  -0.0013   0.0202   0.2306   0.3379
1.0000

textmessag~g |  -0.1667  -0.0110  -0.2991  -0.0661  -0.1002  -0.0251   0.2219  -0.0882
0.7916   1.0000



. *creating concern and policy factor

. polychoric  personalsocialmedianotappropriat  cooperativesocialmediareceivedpo
socialmediabringsnegativepublici

>   socialmediaobjectivesareunclear  socialmediasharesinfowithcompeti



Polychoric correlation matrix



                                    personalsocialmedianotappropriat
cooperativesocialmediareceivedpo

personalsocialmedianotappropriat                                   1

cooperativesocialmediareceivedpo                           .17681825
1

socialmediabringsnegativepublici                           .30764948
.65889499

 socialmediaobjectivesareunclear                           .16078364
.65545672

socialmediasharesinfowithcompeti                           .25013282
.41205877



                                    socialmediabringsnegativepublici
socialmediaobjectivesareunclear

socialmediabringsnegativepublici                                   1

 socialmediaobjectivesareunclear                           .45629532
1
```

```
socialmediasharesinfowithcompeti                          .41981505
.49515365



                                  socialmediasharesinfowithcompeti

socialmediasharesinfowithcompeti                                  1



. display r(sum_w)

101



.

.  matrix f= r(R)



.

. factormat f, n(105)

(obs=105)



Factor analysis/correlation                       Number of obs    =      105

    Method: principal factors                     Retained factors =        3

    Rotation: (unrotated)                         Number of params =       10

    --------------------------------------------------------------------------

         Factor  |   Eigenvalue   Difference        Proportion   Cumulative

    -------------+------------------------------------------------------------
```

```
    Factor1  |      2.14442      1.99371            1.0737       1.0737
    Factor2  |      0.15071      0.08207            0.0755       1.1492
    Factor3  |      0.06864      0.21524            0.0344       1.1836
    Factor4  |     -0.14659      0.07345           -0.0734       1.1102
    Factor5  |     -0.22005            .           -0.1102       1.0000
-------------------------------------------------------------------------
LR test: independent vs. saturated:  chi2(10) =  164.26 Prob>chi2 = 0.0000


Factor loadings (pattern matrix) and unique variances

-------------------------------------------------------------
    Variable |  Factor1   Factor2   Factor3 |   Uniqueness
-------------+------------------------------+--------------
personalso~t |   0.3103    0.2836    0.0282 |      0.8225
cooperativ~o |   0.8068   -0.1345   -0.1093 |      0.3190
socialmed~ci |   0.7269    0.1318   -0.1315 |      0.4370
socialmedi~r |   0.7258   -0.1684    0.1097 |      0.4328
socialmed~ti |   0.5848    0.0803    0.1630 |      0.6250
-------------------------------------------------------------


. rotate


Factor analysis/correlation                       Number of obs    =      105
```

Method: principal factors Retained factors = 3

Rotation: orthogonal varimax (Kaiser off) Number of params = 10

Factor	Variance	Difference	Proportion	Cumulative
Factor1	1.86518	1.54029	0.9339	0.9339
Factor2	0.32489	0.15119	0.1627	1.0966
Factor3	0.17370	.	0.0870	1.1836

LR test: independent vs. saturated: chi2(10) = 164.26 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Uniqueness
personalso~t	0.1882	0.3505	0.1386	0.8225
cooperativ~o	0.8116	0.1391	0.0546	0.3190
socialmed~ci	0.6518	0.3677	0.0551	0.4370
socialmedi~r	0.7121	0.0368	0.2425	0.4328
socialmed~ti	0.4892	0.2147	0.2994	0.6250

```
Factor rotation matrix

    ----------------------------------------
                 | Factor1  Factor2  Factor3
    -------------+--------------------------
         Factor1 |  0.9279   0.2987   0.2230
         Factor2 | -0.3353   0.9303   0.1489
         Factor3 | -0.1630  -0.2130   0.9634
    ----------------------------------------

. predict concernsaboutsocialmedia
(regression scoring assumed)

Scoring coefficients (method = regression; based on varimax rotated factors)

    -------------------------------------------
        Variable |  Factor1   Factor2   Factor3
    -------------+-----------------------------
    personalso~t | -0.01716   0.24814   0.08874
    cooperativ~o |  0.48122  -0.08773  -0.18636
    socialmed~ci |  0.17884   0.38115  -0.07502
    socialmedi~r |  0.27665  -0.17717   0.25663
```

```
    socialmed~ti |  0.08310   0.11646   0.25847

    -------------------------------------------


(variable means assumed 0; use means() option of factormat for nonzero means)

(variable std. deviations assumed 1; use sds() option of factormat to change)



. *creating concernempoli factor

. tetrachoric  textmessagingpolicy chatplatformpolicy emailpolicy personalphonepolicy
socialmediapolicy noneofthea

> bove

(obs=104)



matrix with tetrachoric correlations is not positive semidefinite;

  it has 1 negative eigenvalue

  maxdiff(corr,adj-corr) =  0.0004

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



             | textme~y chatpl~y emailp~y person~y social~y noneof~e

-------------+------------------------------------------------------

textmessag~y |   1.0000

chatplatfo~y |   0.6713   1.0000

 emailpolicy |   0.7634   0.6315   1.0000

personalph~y |   0.7944   0.6156   0.9050   1.0000

socialmedi~y |   0.6671   0.8343   0.7498   0.6947   1.0000
```

```
noneofthea~e |  -0.8293  -0.7923  -0.9152  -0.9425  -0.7248   1.0000



. tetrachoric  textmessagingpolicy chatplatformpolicy emailpolicy personalphonepolicy
socialmediapolicy noneofthea

> bove, posdef

(obs=104)



matrix with tetrachoric correlations is not positive semidefinite;

  it has 1 negative eigenvalue

  maxdiff(corr,adj-corr) =  0.0004

  (adj-corr: tetrachoric correlations adjusted to be positive semidefinite)



    adj-corr | textme~y chatpl~y emailp~y person~y social~y noneof~e

-------------+------------------------------------------------------

textmessag~y |   1.0000

chatplatfo~y |   0.6713   1.0000

 emailpolicy |   0.7634   0.6315   1.0000

personalph~y |   0.7943   0.6156   0.9050   1.0000

socialmedi~y |   0.6671   0.8342   0.7497   0.6946   1.0000

noneofthea~e |  -0.8292  -0.7920  -0.9149  -0.9422  -0.7248   1.0000



.

. display r(sum_w)

.
```

```
.

.  matrix g= r(corr)


.

. factormat g, n(105)

(obs=105)

(collinear variables specified)


Factor analysis/correlation                       Number of obs    =      105

    Method: principal factors                     Retained factors =        5

    Rotation: (unrotated)                         Number of params =       15


    Beware: solution is a Heywood case

            (i.e., invalid or boundary values of uniqueness)


    ------------------------------------------------------------------------

         Factor  |   Eigenvalue   Difference        Proportion   Cumulative

    -------------+----------------------------------------------------------

        Factor1  |      4.80740      4.23578            0.8451       0.8451

        Factor2  |      0.57162      0.34663            0.1005       0.9456

        Factor3  |      0.22499      0.13691            0.0396       0.9852

        Factor4  |      0.08808      0.08403            0.0155       1.0007
```

```
    Factor5  |      0.00405      0.01189            0.0007       1.0014
    Factor6  |     -0.00784            .           -0.0014       1.0000
-------------------------------------------------------------------------
LR test: independent vs. saturated:  chi2(15) =       . Prob>chi2 =      .


Factor loadings (pattern matrix) and unique variances

-----------------------------------------------------------------------------
    Variable |  Factor1   Factor2   Factor3   Factor4   Factor5 |   Uniqueness
-------------+-------------------------------------------------+--------------
textmessag~y |   0.8243   -0.0735   -0.0725    0.0377   -0.0328 |      0.3074
chatplatfo~y |   0.8415    0.4867   -0.2292   -0.0439    0.0264 |     -0.0001
 emailpolicy |   0.9295   -0.2510    0.1664   -0.2126    0.0158 |     -0.0001
personalph~y |   0.9276   -0.3237    0.0009    0.1840    0.0320 |     -0.0000
socialmedi~y |   0.8661    0.3752    0.3229    0.0698   -0.0135 |     -0.0003
noneofthea~e |  -0.9723    0.1444    0.1878    0.0284    0.0286 |     -0.0031
-----------------------------------------------------------------------------


. rotate


Factor analysis/correlation                       Number of obs    =      105
    Method: principal factors                     Retained factors =        5
    Rotation: orthogonal varimax (Kaiser off)     Number of params =       15
```

Beware: solution is a Heywood case

(i.e., invalid or boundary values of uniqueness)

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.92029	1.40372	0.5134	0.5134
Factor2	1.51657	0.37406	0.2666	0.7800
Factor3	1.14250	1.03211	0.2009	0.9808
Factor4	0.11039	0.10401	0.0194	1.0003
Factor5	0.00638	.	0.0011	1.0014

LR test: independent vs. saturated: chi2(15) = . Prob>chi2 = .

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Uniqueness
textmessag~y	0.6693	0.4064	0.2774	-0.0009	-0.0496	0.3074
chatplatfo~y	0.3191	0.8665	0.3827	0.0314	-0.0017	-0.0001
emailpolicy	0.8354	0.2377	0.3907	0.3051	-0.0031	-0.0001

```
    personalph~y |   0.9158    0.2468    0.2954   -0.1119    0.0236 |     -0.0000
    socialmedi~y |   0.3791    0.4698    0.7967    0.0324   -0.0077 |     -0.0003
    noneofthea~e |  -0.8307   -0.5124   -0.2108   -0.0526    0.0574 |     -0.0031
    ------------------------------------------------------------------------------


Factor rotation matrix


    ------------------------------------------------------------
                 | Factor1  Factor2  Factor3  Factor4  Factor5
    -------------+----------------------------------------------
         Factor1 |  0.7452   0.5032   0.4333   0.0592  -0.0178
         Factor2 | -0.6608   0.6203   0.4210  -0.0358   0.0024
         Factor3 | -0.0684  -0.5901   0.7784   0.1961   0.0523
         Factor4 |  0.0562  -0.1089   0.1654  -0.9774   0.0489
         Factor5 |  0.0158   0.0438  -0.0422   0.0388   0.9973
    ------------------------------------------------------------


. gen ySM =weuseplanningtousesocialmediatoc


.

. ologit ySM ManagerCharacteristics AttToValueofCommTech CooperativeCharacteristics
concernsaboutsocialmedia

> averagehoursonlineaday   cottonginresponsetotal utilitymemberresponsetotal
mbpsknowledge
```

```
Iteration 0:   log likelihood = -102.65032

Iteration 1:   log likelihood = -81.420296

Iteration 2:   log likelihood = -78.456434

Iteration 3:   log likelihood = -78.400989

Iteration 4:   log likelihood = -78.400925

Iteration 5:   log likelihood = -78.400925


Ordered logistic regression                     Number of obs   =         77

                                                LR chi2(8)      =      48.50

                                                Prob > chi2     =     0.0000

Log likelihood = -78.400925                     Pseudo R2       =     0.2362

------------------------------------------------------------------------------

         ySM |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

ManagerCha~s |   .3745606   .2703166     1.39   0.166    -.1552503    .9043714

AttToValue~h |   1.189429   .3852217     3.09   0.002     .4344086     1.94445

Cooperativ~s |   .0363845   .4473659     0.08   0.935    -.8404365    .9132055

concernsab~a |  -1.797535   .4247417    -4.23   0.000    -2.630014   -.9650569

averagehou~y |  -.0888679   .0958758    -0.93   0.354    -.2767809    .0990452

cottonginr~l |   .6444686   .6520912     0.99   0.323    -.6336066    1.922544

utilitymem~l |  -.4023985   .8073563    -0.50   0.618    -1.984788    1.179991
```

```
mbpsknowle~e |  -.1604207   .5467825    -0.29   0.769    -1.232095    .9112532

-------------+----------------------------------------------------------------

       /cut1 |  -4.615903   2.341935                     -9.206011   -.0257949

       /cut2 |  -3.037692   2.285385                     -7.516964    1.441581

       /cut3 |  -.8540494   2.245904                      -5.25594    3.547841

       /cut4 |   2.698549   2.238921                     -1.689657    7.086754

------------------------------------------------------------------------------



.  findit spost



. ologit ySM ManagerCharacteristics AttToValueofCommTech CooperativeCharacteristics
concernsaboutsocialmedia

> averagehoursonlineaday   cottonginresponsetotal utilitymemberresponsetotal
mbpsknowledge,or



Iteration 0:   log likelihood = -102.65032

Iteration 1:   log likelihood = -81.420296

Iteration 2:   log likelihood = -78.456434

Iteration 3:   log likelihood = -78.400989

Iteration 4:   log likelihood = -78.400925

Iteration 5:   log likelihood = -78.400925



Ordered logistic regression                     Number of obs   =         77

                                                LR chi2(8)      =      48.50
```

```
                                                Prob > chi2     =     0.0000
Log likelihood = -78.400925                     Pseudo R2       =     0.2362

------------------------------------------------------------------------------
         ySM | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
ManagerCha~s |   1.454352   .3931356     1.39   0.166     .8562008    2.470379
AttToValue~h |   3.285205   1.265532     3.09   0.002      1.54405    6.989785
Cooperativ~s |   1.037055   .4639428     0.08   0.935     .4315221    2.492299
concernsab~a |   .1657068   .0703826    -4.23   0.000     .0720775    .3809615
averagehou~y |   .9149665   .0877231    -0.93   0.354     .7582206    1.104116
cottonginr~l |   1.904974   1.242217     0.99   0.323     .5306744    6.838332
utilitymem~l |   .6687142   .5398906    -0.50   0.618     .1374098    3.254344
mbpsknowle~e |   .8517853   .4657413    -0.29   0.769      .291681    2.487438
-------------+----------------------------------------------------------------
       /cut1 |  -4.615903   2.341935                     -9.206011   -.0257949
       /cut2 |  -3.037692   2.285385                     -7.516964    1.441581
       /cut3 |  -.8540494   2.245904                      -5.25594    3.547841
       /cut4 |   2.698549   2.238921                     -1.689657    7.086754
------------------------------------------------------------------------------

.

.  prvalue
```

```
ologit: Predictions for ySM


Confidence intervals by delta method


                                95% Conf. Interval

     Pr(y=1|x):       0.0163   [-0.0043,    0.0369]

     Pr(y=2|x):       0.0580   [ 0.0072,    0.1087]

     Pr(y=3|x):       0.3417   [ 0.2078,    0.4755]

     Pr(y=4|x):       0.5454   [ 0.4057,    0.6851]

     Pr(y=5|x):       0.0387   [ 0.0027,    0.0747]


    ManagerCha~s  AttToValue~h  Cooperativ~s  concernsab~a  averagehou~y  cottonginr~l
utilitymem~l

x=     .03203196     4.3583962     -.0646104     2.9849723     3.5194805     .19480519
.11688312


    mbpsknowle~e

x=     .67532468


.  gen  yIT =employeededicatedtoit

(2 missing values generated)


.  logit  yIT ManagerCharacteristics  AttToValueofCommTech CooperativeCharacteristics
concernsaboutsocialmedia  av
```

```
> eragehoursonlineaday   cottonginresponsetotal utilitymemberresponsetotal  mbpsknowledge


Iteration 0:   log likelihood = -50.475875

Iteration 1:   log likelihood = -33.934031

Iteration 2:   log likelihood =  -32.86921

Iteration 3:   log likelihood = -32.765677

Iteration 4:   log likelihood = -32.765235

Iteration 5:   log likelihood = -32.765235


Logistic regression                               Number of obs   =         75

                                                  LR chi2(8)      =      35.42

                                                  Prob > chi2     =     0.0000

Log likelihood = -32.765235                       Pseudo R2       =     0.3509

c

------------------------------------------------------------------------------

         yIT |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]

-------------+----------------------------------------------------------------

ManagerCha~s |   .0470065   .3769935     0.12   0.901    -.6918872    .7859002

AttToValue~h |    .337052   .5187451     0.65   0.516    -.6796698    1.353774

Cooperativ~s |   3.410199   1.927268     1.77   0.077     -.367177    7.187574

concernsab~a |  -.8977206   .4796414    -1.87   0.061      -1.8378    .0423592

averagehou~y |   .1028434   .1287622     0.80   0.424    -.1495258    .3552126

cottonginr~l |  -1.750232   1.215041    -1.44   0.150    -4.131668    .6312046
```

```
utilitymem~l |   1.765239    1.09165     1.62   0.106    -.3743562    3.904835
mbpsknowle~e |   .7183789   .7849429     0.92   0.360    -.8200809    2.256839
       _cons |   .2978696   2.995895     0.10   0.921    -5.573977    6.169716
------------------------------------------------------------------------------


. logit yIT ManagerCharacteristics AttToValueofCommTech CooperativeCharacteristics
concernsaboutsocialmedia av

> eragehoursonlineaday cottonginresponsetotal utilitymemberresponsetotal
mbpsknowledge,or


Iteration 0:   log likelihood = -50.475875
Iteration 1:   log likelihood = -33.934031
Iteration 2:   log likelihood =  -32.86921
Iteration 3:   log likelihood = -32.765677
Iteration 4:   log likelihood = -32.765235
Iteration 5:   log likelihood = -32.765235


Logistic regression                             Number of obs   =         75
                                                LR chi2(8)      =      35.42
                                                Prob > chi2     =     0.0000
Log likelihood = -32.765235                     Pseudo R2       =     0.3509


------------------------------------------------------------------------------
         yIT | Odds Ratio   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
ManagerCha~s |   1.048129   .3951378     0.12   0.901     .5006304    2.194381
AttToValue~h |   1.400812   .7266643     0.65   0.516     .5067843     3.87201
Cooperativ~s |   30.27125   58.34082     1.77   0.077      .692687     1322.89
concernsab~a |   .4074975   .1954526    -1.87   0.061     .1591671    1.043269
averagehou~y |   1.108318   .1427094     0.80   0.424     .8611162    1.426484
cottonginr~l |   .1737337   .2110935    -1.44   0.150     .0160561    1.879874
utilitymem~l |    5.84297    6.37848     1.62   0.106     .6877319    49.64187
mbpsknowle~e |   2.051106   1.610001     0.92   0.360      .440396    9.552843
------------------------------------------------------------------------------


.  prvalue


logit: Predictions for yIT


Confidence intervals by delta method


                              95% Conf. Interval

  Pr(y=1|x):          0.4054   [ 0.2156,    0.5951]

  Pr(y=0|x):          0.5946   [ 0.4049,    0.7844]


    ManagerCha~s  AttToValue~h  Cooperativ~s  concernsab~a  averagehou~y  cottonginr~l
utilitymem~l

x=     .02865211      4.346764    -.05821575     2.9933297     3.5466667     .18666667
.12
```

```
    mbpsknowle~e

x=           .68



.

.

end of do-file



.
```